



**Test Report for Rockwell Automation  
Report No. EX0154-1 Issue 2**



## TEST REPORT

Applicant	Rockwell Automation
Address	2 Executive Dr., Chelmsford, MA 01824

FCC ID	USM-440G-TZ
ISED Canada IC	26075-440GTZ
PMN Model/HVIN	TLSZ Guardmaster GuardLocking Switch 440G-TZS21UPRH, 440G-TZS21UPLH, 440G-TZS21UTRH, 440G-TZS21UTLH
Date of tests	March 13, 2023 – May 30, 2023
FCC Test Firm DN Canada CABID	US1028 US0106

The tests have been carried out according to the requirements of the following standard:

**FCC Part 15, Subpart C, Section 15.209**  
 **ISED Canada RSS-210 Issue 10 Section 7.3**

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

Prepared by Ryan Brown Sr. EMC/Wireless Engineer	Approved by Yunus Faziloglu Wireless Manager
Report Issue Date: August 11, 2023	Issue Number: 2

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
1	Original release	Jun-8-2023
2	<p>Updated the Note on Page 24 to The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of <math>377\Omega</math>. For example, the measurement frequency 124.997KHz resulted in a level of 65.3dBuV/m, which is equivalent to <math>65.3 - 51.5 = 13.8</math>dBuA/m, which has the same margin, -40.4 dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit.</p> <p>Updated the PMN to TLSZ Guardmaster Guardlocking Switch</p>	August 11, 2023



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## 1 SUMMARY OF TEST RESULTS

EUT was tested against the following requirements:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.209), RSS-Gen				
STANDARD SECTION		TEST TYPE AND LIMIT	APPLICABLE	RESULT
47 CFR	RSS			
15.207	Gen 8.8	AC Power Line Conducted Emissions	Y	PASS
15.205 15.209	Gen 8.9 Gen 8.10	Radiated Spurious Emissions	Y	PASS
15.209	210 7.3 Gen 8.9	Fundamental Field Strength	Y	PASS
--	Gen 6.7	99% Occupied Bandwidth	Y	PASS
15.203	Gen 6.8	Antenna Requirement	Y	PASS



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## 2 MEASUREMENT UNCERTAINTY

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. Values for measurement uncertainty are calculated per ETSI TR 100 028 (2001).

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radio frequency (@ 2.4GHz)	$3.23 \times 10^{-8}$	$1 \times 10^{-7}$
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.



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### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>NOMINAL VOLTAGE</b>	24VDC
<b>MODULATION TYPES</b>	ASK
<b>DATA RATES</b>	4kbps
<b>OPERATING FREQUENCY</b>	125kHz
<b>EUT Power Setting</b>	Default
<b>FUNDAMENTAL FIELD STRENGTH</b>	69.8dB $\mu$ V/m at 3m
<b>ANTENNA TYPE</b>	Inductor coil

<b>EUT Ports:</b>									
<b>Port Label</b>	<b>Port Type</b>	<b>No. of ports</b>	<b>No. Populated</b>	<b>Cable Type</b>	<b>Shielded</b>	<b>Ferrites</b>	<b>Length</b>	<b>Max Length</b>	<b>In/Out Type</b>
8-pin micro M12	I/O + Power	1	1	8 conductor	No	No	10m	10m	Indoor

Lowest clock frequency in the device (used/generated): 125kHz

Highest clock frequency in the device (used/generated): 8MHz

The chart below summarizes the differences amongst the four variants of the TLSZ Guard Locking Switch.

<b>Cat. No.</b>	<b>Function</b>	<b>Value</b>
440G-TZS21UPRH	Lock Status	24V when actuator is unlocked 0V when actuator is locked
440G-TZS21UPLH	Actuator Status	24V when actuator inserted (gate closed) 0V when actuator removed (gate open)
440G-TZS21UTRH		
440G-TZS21UTLH		

<b>Cat. No.</b>	<b>Switch Type</b>	<b>Function</b>
440G-TZS21UPRH	Power to Release	24V unlocks the actuator 0V locks the actuator
440G-TZS21UTRH		
440G-TZS21UPLH	Power to Lock	24V locks the actuator 0V unlocks the actuator
440G-TZS21UTLH		

#### NOTES:

1. For a more detailed description of the EUT, please refer to the manufacturer's specifications, operational description or the user's manual.
2. For photos of the EUT, please refer to External and Internal Photos exhibits.



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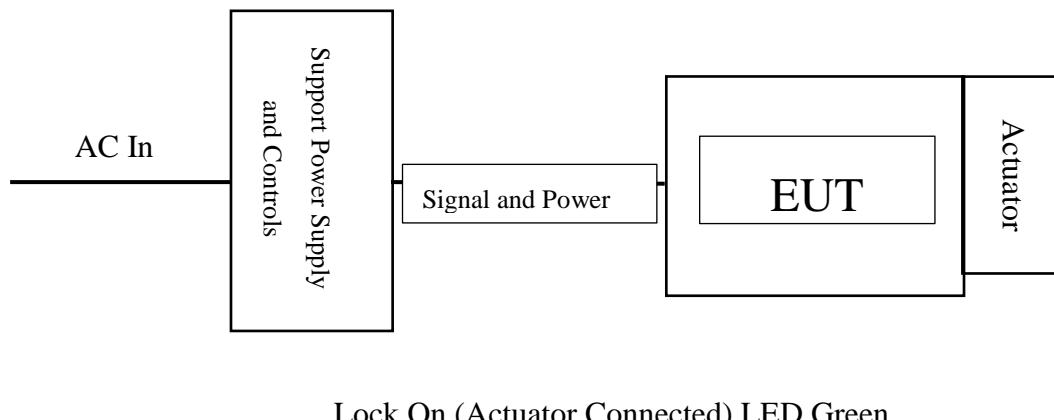
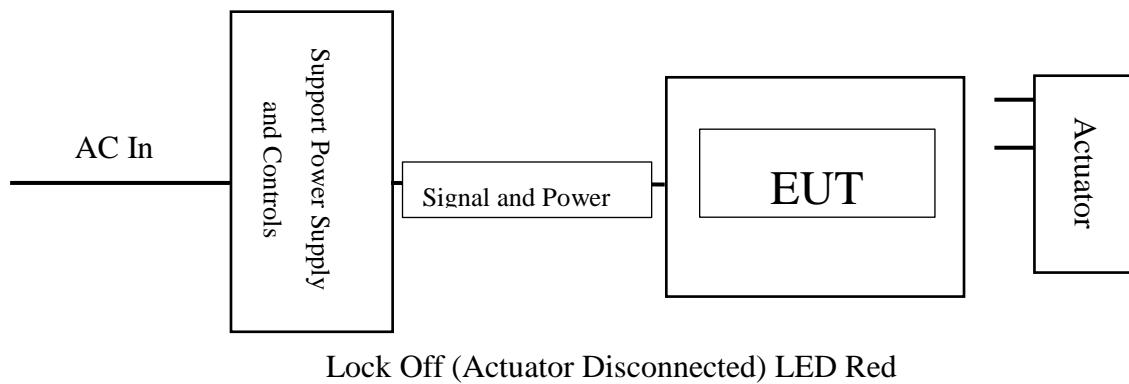
### 3.2 DESCRIPTION OF TEST MODES

EUT operates at a single channel at 125kHz. EUT was powered by an external AC/DC Power supply that supplied 24VDC to the EUT. The 125kHz RFID is always on.

EUT configuration modes:

TEST MODE	DESCRIPTION
A	Continuous Transmit at 4kbps (Duty-cycle: 100%)

### EUT SETUP BLOCK DIAGRAMS



Note: Same EUT setup for both radiated and AC line conducted emissions



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Following channels/modes were selected for the applicable tests below.

TEST	TEST MODE	AVAILABLE CHANNELS	TESTED CHANNEL	MODULATION TYPE	DATA RATE (kbps)	Notes
FFS	A	1	1	ASK	4	0, 1, 3, 4, 6
OBW	A	1	1	ASK	4	1, 4
RSE (9k-30M)	A	1	1	ASK	4	1, 3
RSE (30M-1G)	A	1	1	ASK	4	2, 3
PLCE	A	1	1	ASK	4	5

Note 0: Measurement performed on all model variants. Since the readings for all variants were very close to each other, Model 440G-TZS21UPRH was selected for the rest of the tests to represent the other variants.

Note 1: Worst-case EUT orientation was X axis as shown in the Test Setup Photos exhibit.

Note 2: Worst-case EUT orientation was Y axis as shown in the Test Setup Photos exhibit.

Note 3: Both Lock OFF and Lock ON (Actuator Position 1 and Position 2) configurations were tested. For Lock ON configuration, Actuator Position 1 was found to be the worst case.

Note 4: Measurement was performed with Peak Max Hold.

Note 5: Measurement was performed in Lock OFF and Lock ON (Actuator Position 1).

**FFS:** Fundamental Field Strength

**OBW:** 99% Occupied Bandwidth

**RSE (9k-30M):** Radiated Spurious Emissions (9kHz-30MHz)

**RSE (30M-1G):** Radiated Spurious Emissions (30MHz-1GHz)

**PLCE:** Power Line Conducted Emissions

**TEST CONDITIONS:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY	DATE OF TEST
FFS	21.9°C, 49% RH, 986 mbar 22.0°C, 52% RH, 990 mbar	24VDC	RB	3/14/2023 5/30/2023
OBW	22.0°C, 43.2% RH, 1004 mbar	24VDC	RB	3/16/2023
RSE	22.7°C, 44.8% RH, 992 mbar 22.0°C, 43.2% RH, 1004 mbar 21.9°C, 41.1% RH, 1013 mbar	24VDC	RB	3/15/2023 3/16/2023 3/20/2023
PLCE	21.3°C, 50% RH, 1010 mbar	120V 60Hz	BV	3/13/2023



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### **3.3 MEASUREMENT PROCEDURES USED**

All tests were performed in accordance with the following measurement procedures:

**ANSI C63.10-2013**

**RSS-Gen Issue 5**

### **3.4 DESCRIPTION OF SUPPORT EQUIPMENT**

<b>Support Equipment</b>	<b>Model #</b>	<b>Serial #</b>
Allen Bradley 24VDC Power Supply	1606-XLP72E	N/A



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## 4 TEST RESULTS

### 4.1 AC POWER LINE CONDUCTED EMISSIONS

#### 4.1.1 LIMITS

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)		
0.15 ~ 0.5	Quasi-peak		Average
	66 to 56		56 to 46
	56		46
0.5 ~ 5	60		50
5 ~ 30			

**NOTE:** 1. Lower limit applies at the transition frequencies.

2. Limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

#### 4.1.2 TEST EQUIPMENT USED

Date of Test: 3/13/2023

Rev. 3/3/2023								
<b>Spectrum Analyzers / Receivers / Preselectors</b> Rental EXA Signal Analyzer(1118473)	Range 9KHz-26.5GHz	MN N9010A-526;N	Mfr AT	SN MY51170076	Asset 1118473	Cat I	Calibration Due 8/24/2023	Calibrated on 8/24/2022
<b>LISNs/Measurement Probes</b> LISN Asset 1726 LISN Asset 1727	Range 150kHz-30MHz 150kHz-30MHz	MN LI-150A LI-150A	Mfr Com-Power Com-Power	SN 201092 201093	Asset 1726 1727	Cat I I	Calibration Due 1/4/2024 1/4/2024	Calibrated on 1/4/2023 1/4/2023
<b>Conducted Test Sites (Mains / Telco)</b> CEMI 5	FCC Code 719150			VCCI Code A-0015		Cat III	Calibration Due NA	Calibrated on N/A
<b>Meteorological Meters/Chambers</b> Weather Clock (Pressure Only) Asset #2657		MN BA928 1235C97	Mfr Oregon Scientific Control Company	SN C3166-1 200435369	Asset 831 2657	Cat I I	Calibration Due 12/15/2025 8/18/2025	Calibrated on 12/15/2022 8/18/2022
<b>Cables</b> CEMI-02	Range 9kHz - 2GHz		Mfr C-S			Cat II	Calibration Due 2/14/2024	Calibrated on 2/14/2023
<b>Attenuators</b> 20dB Attenuator-64	Range 9kHz-2GHz	MN	Mfr	SN	Asset N/A	Cat II	Calibration Due 8/3/2023	Calibrated on 8/3/2022

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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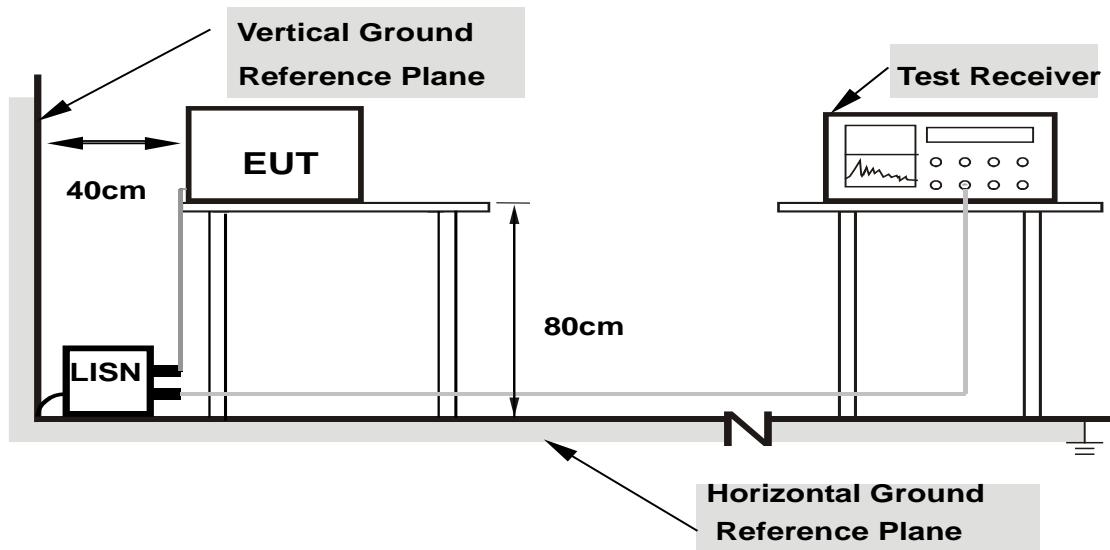
#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded. RBW of 9kHz and VBW of 30kHz were used during measurement.

#### 4.1.4 DEVIATIONS

No deviations from the standard.

#### 4.1.5 TEST SETUP



**Note:**

1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to Test Setup Photos exhibit.

#### 4.1.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.



## Test Report for Rockwell Automation

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#### 4.1.7 TEST RESULTS

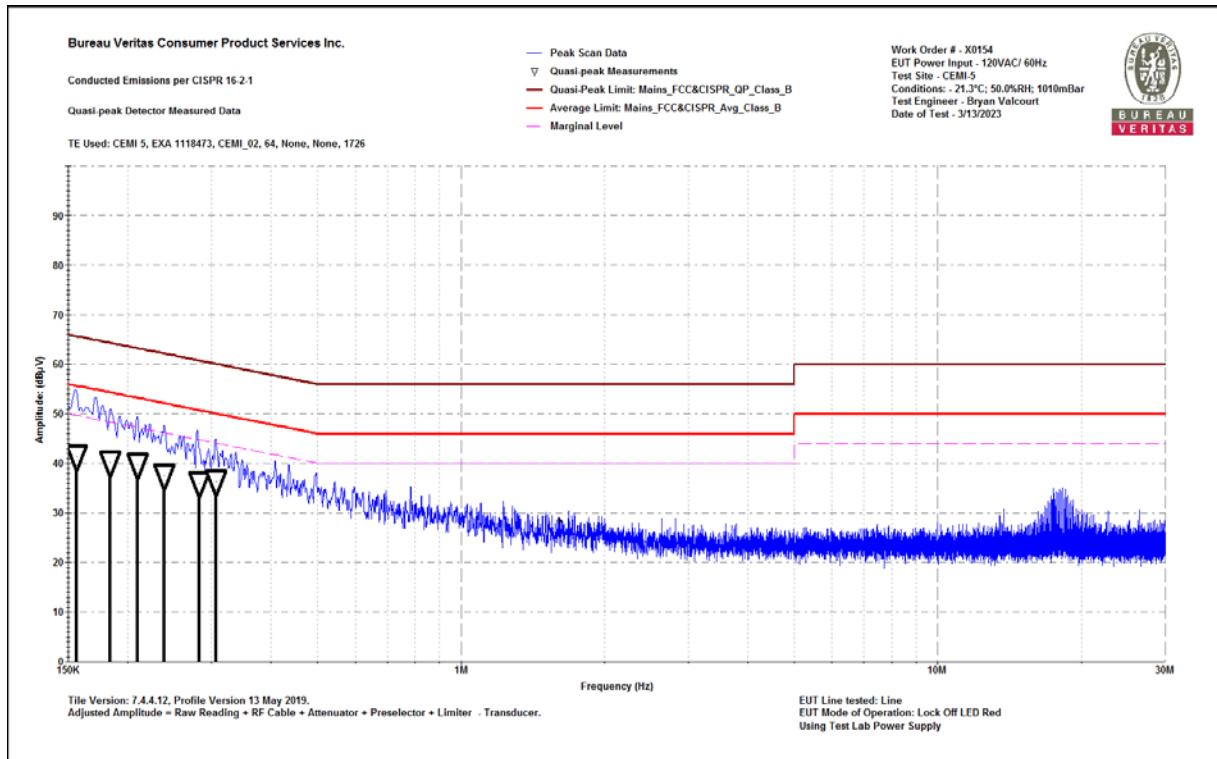
##### Lock Off (LED Red)

Bureau Veritas Consumer Product Services Inc.  
 Conducted Emissions per CISPR 16-2-1  
 Quasi-peak Detector Data  
 Notes:  
 EUT Line tested: Line  
 EUT Mode of Operation: Lock Off LED Red  
 Using Test Lab Power Supply

Work Order # - X0154  
 EUT Power Input - 120VAC/ 60Hz  
 Test Site - CEMI-5  
 Conditions: - 21.3°C; 50.0%RH; 1010mBar  
 Test Engineer - Bryan Valcourt  
 Date of Test - 3/13/2023

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB)	Adjusted QP Amplitude (dB $\mu$ V)	QP Lim: Mains_FCC&CISP R_QP_Class_B (dB $\mu$ V)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISP R_Avg_Class_B (dB $\mu$ V)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.156	21.249	20.2	41.4	65.7	-24.2	PASS		55.7	-14.2	PASS	
0.184	19.932	20.2	40.1	64.3	-24.2	PASS		54.3	-14.2	PASS	
0.21	19.529	20.2	39.7	63.2	-23.5	PASS	-23.5	53.2	-13.5	PASS	-13.5
0.238	17.392	20.2	37.5	62.2	-24.6	PASS		52.2	-14.6	PASS	
0.282	15.764	20.2	35.9	60.8	-24.8	PASS		50.8	-14.8	PASS	
0.306	16.209	20.2	36.4	60.1	-23.7	PASS		50.1	-13.7	PASS	

##### 0.15-30MHz Line



##### 0.15-30MHz Line



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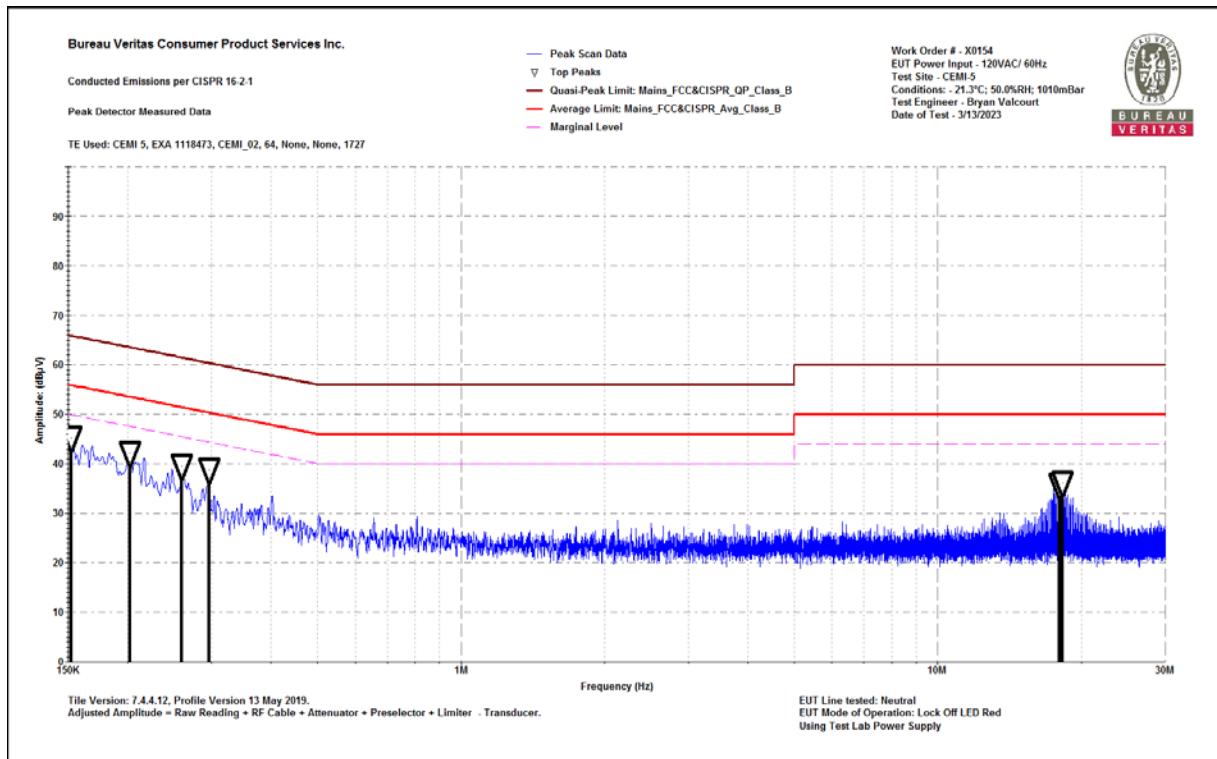


Bureau Veritas Consumer Product Services Inc.  
Conducted Emissions per CISPR 16-2-1  
Peak Detector Data  
Notes:  
EUT Line tested: Neutral  
EUT Mode of Operation: Lock Off LED Red  
Using Test Lab Power Supply

Work Order # - X0154  
EUT Power Input - 120VAC/ 60Hz  
Test Site - CEMI-5  
Conditions: - 21.3°C; 50.0%RH; 1010mBar  
Test Engineer - Bryan Valcourt  
Date of Test - 3/13/2023

Frequency (MHz)	Raw Pk Reading (dB $\mu$ V)	Correction Factor (dB)	Adjusted Pk Amplitude (dB $\mu$ V)	QP Lim: Mains_FCC&CISP R_QP_Class_B (dB $\mu$ V)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISP R_Avg_Class_B (dB $\mu$ V)	Margin to Avg Limit (dB)	Pk to Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.152	25	20.1	45.2	65.9	-20.7	PASS	-20.7	55.9	-10.7	PASS	-10.7
0.202	22.1	20.1	42.2	63.5	-21.3	PASS		53.5	-11.3	PASS	
0.26	19.3	20.1	39.5	61.4	-22	PASS		51.4	-12	PASS	
0.296	18.6	20.1	38.7	60.3	-21.7	PASS		50.3	-11.7	PASS	
18.002	15.3	20.4	35.7	60	-24.3	PASS		50	-14.3	PASS	
18.252	15.7	20.4	36.1	60	-23.9	PASS		50	-13.9	PASS	

## 0.15-30MHz Neutral



## 0.15-30MHz Neutral

## **Bureau Veritas Consumer Product Services Inc.**

**One Distribution Center Circle, #1  
Littleton, MA**

Tel.: (978) 486-8880  
Fax: (978) 486-8828



# Test Report for Rockwell Automation

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Lock On (LED Green)

Bureau Veritas Consumer Product Services Inc.

## Conducted Emissions per CISPR 16-2-1

### Quasi-peak Detector Data

Notes:

FUT Line tested: Line

#### EUT Mode of Operation: Lock On LED Green

## Using Test Lab Power Supply

Work Order # - X0154

EUT Power Input - 120VAC/ 60Hz

Test Site - CEMI-5

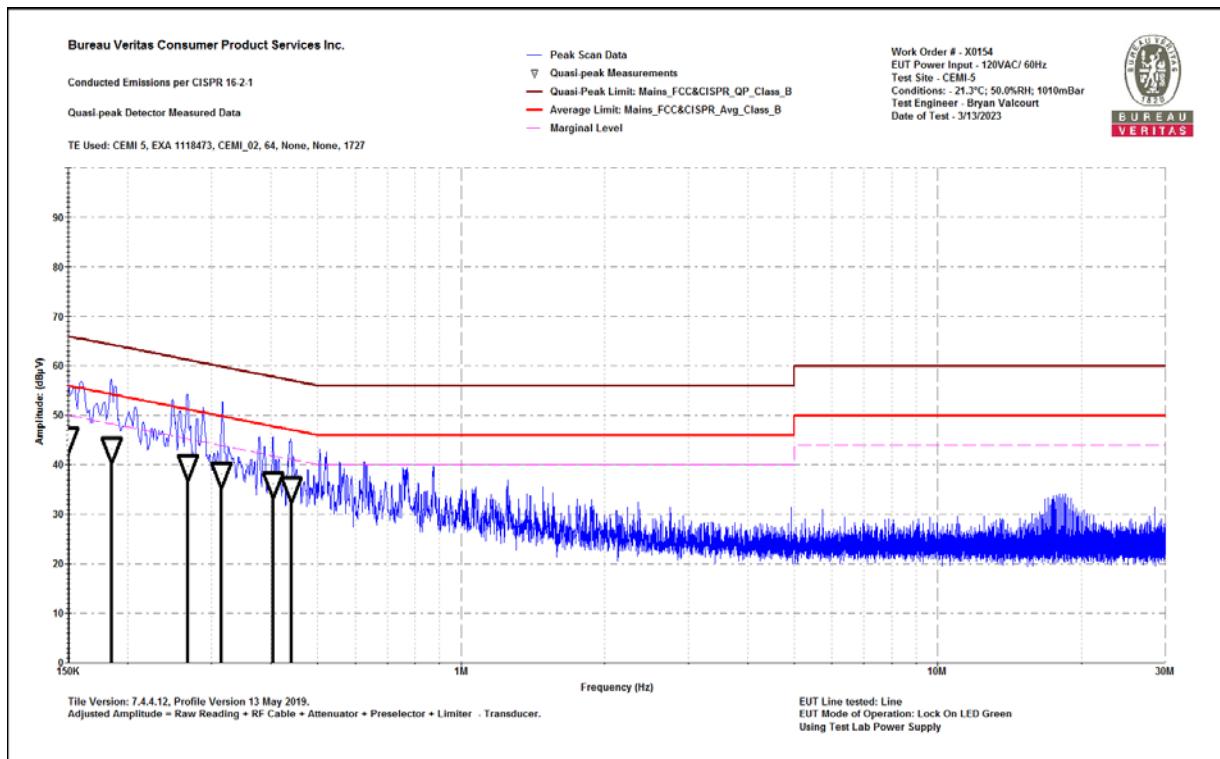
Conditions: - 21.3°C; 50.0%RH; 1010mBar

Test Engineer - Bryan Valcourt

Date of Test - 3/13/2023

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB)	Adjusted QP Amplitude (dB $\mu$ V)	QP Lim: Mains_FCC&CISP R_QP_Class_B (dB $\mu$ V)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISP R_Avg_Class_B (dB $\mu$ V)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.15	24.999	20.1	45.1	66	-20.8	PASS	-20.8	56	-10.8	PASS	-10.8
0.185	23.019	20.1	43.2	64.3	-21.1	PASS		54.3	-11.1	PASS	
0.267	19.499	20.1	39.6	61.2	-21.6	PASS		51.2	-11.6	PASS	
0.314	17.939	20.1	38.1	59.9	-21.8	PASS		49.9	-11.8	PASS	
0.403	15.978	20.1	36.1	57.8	-21.7	PASS		47.8	-11.7	PASS	
0.441	15.047	20.2	35.3	57	-21.8	PASS		47	-11.8	PASS	

## 0.15-30MHz Line



## 0.15-30MHz Line

## **Bureau Veritas Consumer Product Services Inc.**

**One Distribution Center Circle, #1  
Littleton, MA**

Tel.: (978) 486-8880  
Fax: (978) 486-8828



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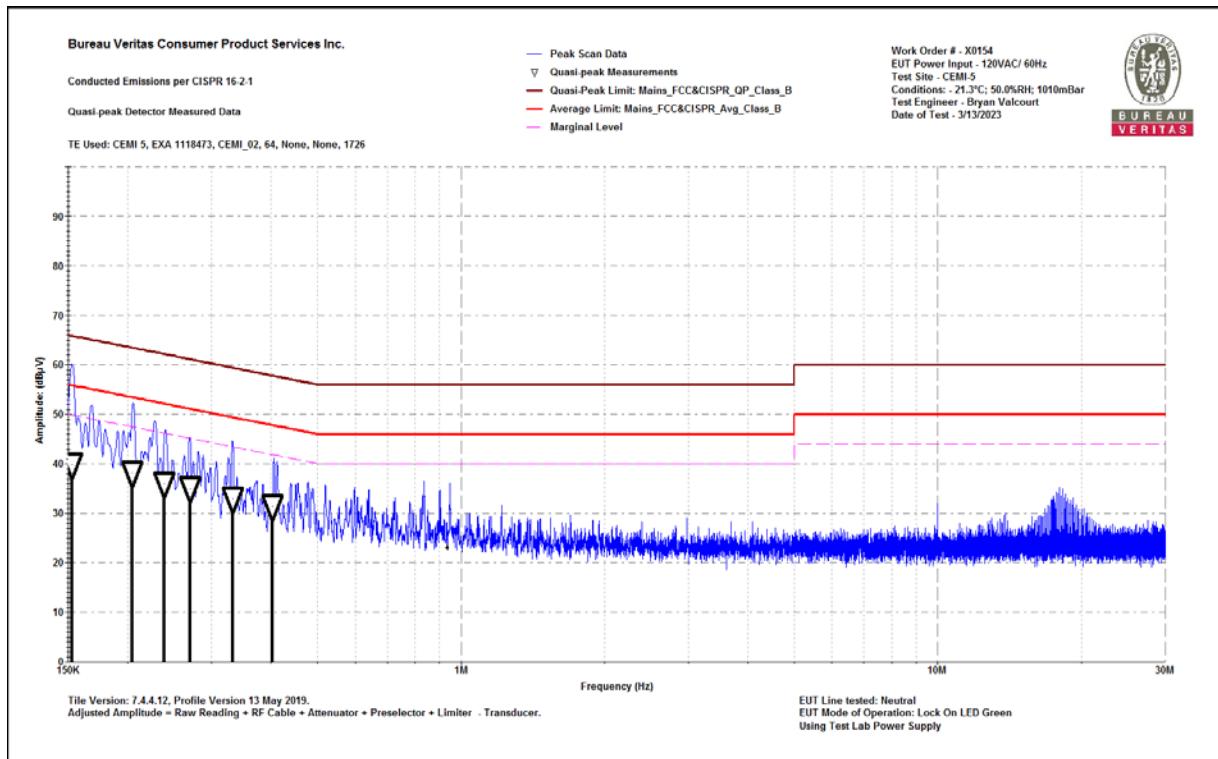


Bureau Veritas Consumer Product Services Inc.  
 Conducted Emissions per CISPR 16-2-1  
 Quasi-peak Detector Data  
 Notes:  
 EUT Line tested: Neutral  
 EUT Mode of Operation: Lock On LED Green  
 Using Test Lab Power Supply

Work Order # - X0154  
 EUT Power Input - 120VAC/ 60Hz  
 Test Site - CEMI-5  
 Conditions - 21.3°C; 50.0%RH; 1010mBar  
 Test Engineer - Bryan Valcourt  
 Date of Test - 3/13/2023

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB)	Adjusted QP Amplitude (dB $\mu$ V)	QP Lim: Mains_FCC&CISP_R_QP_Class_B (dB $\mu$ V)	Margin to QP Limit (dB)	QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISP_R_Avg_Class_B (dB $\mu$ V)	Margin to Avg Limit (dB)	Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
0.153	19.635	20.2	39.8	65.9	-26	PASS		55.9	-16	PASS	
0.205	18.055	20.2	38.2	63.4	-25.2	PASS	-25.2	53.4	-15.2	PASS	-15.2
0.239	15.874	20.2	36	62.1	-26.1	PASS		52.1	-16.1	PASS	
0.271	14.833	20.2	35	61.1	-26.1	PASS		51.1	-16.1	PASS	
0.332	12.702	20.1	32.8	59.4	-26.6	PASS		49.4	-16.6	PASS	
0.402	11.238	20.1	31.4	57.8	-26.4	PASS		47.8	-16.4	PASS	

### 0.15-30MHz Neutral



### 0.15-30MHz Neutral

Bureau Veritas Consumer Product Services Inc.

One Distribution Center Circle, #1 Littleton, MA

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 Fax: (978) 486-8828



**Test Report for Rockwell Automation  
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## 4.2 FUNDAMENTAL FIELD STRENGTH

### 4.2.1 LIMITS

EUT must meet FCC 15.209 and RSS-Gen Issue 5 Section 8.9 Table 6 limit at its fundamental frequency.

Limit conversion below 30MHz is done by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as allowed in FCC 15.31(f)(2).

$$\text{Limit (3m)} = \text{Limit (30m)} + 40 * \log(30/3) = \text{Limit (30m)} + 40$$

$$\text{Limit (3m)} = \text{Limit (300m)} + 40 * \log(300/3) = \text{Limit (300m)} + 80$$

### 4.2.2 TEST SETUP

Same as radiated spurious emissions setup below 30MHz (Section 4.3.5).

### 4.2.3 TEST EQUIPMENT USED

Date of Test: 3/20/2023

Rev. 3/1/2023									
Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1168255)		20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/12/2023	8/12/2022
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 1	719150	2762A-6	A-0015		30-1000MHz	1685	I	11/29/2024	11/29/2022
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO		2049	2615	I	1/18/2025	1/18/2023
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1		831	I	12/15/2025	12/15/2022	
Asset 2707	SD700	EXTECH	A.115171		2707	I	1/13/2025	1/13/2023	
Cables		Range	Mfr			Cat	Calibration Due	Calibrated on	
Asset #2610	9KHz-18GHz	Pasternack				II	3/3/2024	3/3/2023	
Asset #2681	9KHz-18GHz	Pasternack				II	12/13/2023	12/13/2022	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Date of Test: 5/30/2023

Rev. 5/4/2023									
Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Rental MXE EMI Receiver(1170725)		20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	2/21/2024	2/21/2023
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 1	719150	2762A-6	A-0015		30-1000MHz	1685	I	11/29/2024	11/29/2022
Preamps /Couplers Attenuators / Filters		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
8447F: Rental PA	9KHz-1.3GHz	84477F	HP		3113A05395		II	10/17/2023	10/17/2022
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Black BiLog	30-2000MHz	JB1	Sunol		A091604-2	1106	I	6/14/2023	6/14/2021
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1		831	I	12/15/2025	12/15/2022	
Asset 2707	SD700	EXTECH	A.115171		2707	I	1/13/2025	1/13/2023	
Cables		Range	Mfr			Cat	Calibration Due	Calibrated on	
Asset #2474	9KHz-18GHz	MegaPhase				II	11/1/2023	11/1/2022	
Asset #2610	9KHz-18GHz	Pasternack				II	3/3/2024	3/3/2023	
Asset #2681	9KHz-18GHz	Pasternack				II	12/13/2023	12/13/2022	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

### 4.2.4 TEST PROCEDURES

Same as Section 4.3.3.

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#### 4.2.5 DEVIATIONS

No deviations from the standard.

#### 4.2.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.



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## 4.2.7 TEST RESULTS

Model # 440G-TZS21UPRH

Radiated Emissions Table							FCC 15.209(a)															
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	---			Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)							
							Limit	Margin	Result													
<b>Frequency Range:</b> Fundamental (Peak max-hold)													Measurement Distance: 3 m									
<b>Notes:</b> Model # 440G-TZS21UPRH													EUT Max Freq: 8MHz									
X-axis Without Actuator							---	---	---	---	---	---	---									
Para	0.125	59.0	0.0	10.1	0.0	69.1	---	---	---	105.7	-36.6	---	---									
Perp	0.125	53.9	0.0	10.1	0.0	64.0	---	---	---	105.7	-41.7	---	---									
Para to Floor	0.125	51.9	0.0	10.1	0.0	62.0	---	---	---	105.7	-43.7	---	---									
Y-Axis Without Actuator							---	---	---	---	---	---	---									
Para	0.125	43.7	0.0	10.1	0.0	53.8	---	---	---	105.7	-51.9	---	---									
Perp	0.125	34.5	0.0	10.1	0.0	44.6	---	---	---	105.7	-61.1	---	---									
Z-Axis Without Actuator							---	---	---	---	---	---	---									
Para	0.125	57.7	0.0	10.1	0.0	67.8	---	---	---	105.7	-37.9	---	---									
Perp	0.125	56.3	0.0	10.1	0.0	66.4	---	---	---	105.7	-39.3	---	---									
X-axis With Actuator Position 1							---	---	---	---	---	---	---									
Para	0.125	58.7	0.0	10.1	0.0	68.8	---	---	---	105.7	-36.9	---	---									
Perp	0.125	53.9	0.0	10.1	0.0	64.0	---	---	---	105.7	-41.7	---	---									
Para to Floor	0.125	51.8	0.0	10.1	0.0	61.9	---	---	---	105.7	-43.8	---	---									
Y-Axis With Actuator Position 1							---	---	---	---	---	---	---									
Para	0.125	45.3	0.0	10.1	0.0	55.4	---	---	---	105.7	-50.3	---	---									
Perp	0.125	38.8	0.0	10.1	0.0	48.9	---	---	---	105.7	-56.8	---	---									
Z-Axis With Actuator Position 1							---	---	---	---	---	---	---									
Para	0.125	57.0	0.0	10.1	0.0	67.1	---	---	---	105.7	-38.6	---	---									
Perp	0.125	55.7	0.0	10.1	0.0	65.8	---	---	---	105.7	-39.9	---	---									
X-axis With Actuator Position 2							---	---	---	---	---	---	---									
Para	0.125	58.3	0.0	10.1	0.0	68.4	---	---	---	105.7	-37.3	---	---									
Perp	0.125	55.1	0.0	10.1	0.0	65.2	---	---	---	105.7	-40.5	---	---									
Y-Axis With Actuator Position 2							---	---	---	---	---	---	---									
Para	0.125	46.2	0.0	10.1	0.0	56.3	---	---	---	105.7	-49.4	---	---									
Perp	0.125	37.9	0.0	10.1	0.0	48.0	---	---	---	105.7	-57.7	---	---									
Z-Axis With Actuator Position 2							---	---	---	---	---	---	---									
Para	0.125	57.7	0.0	10.1	0.0	67.8	---	---	---	105.7	-37.9	---	---									
Perp	0.125	55.7	0.0	10.1	0.0	65.8	---	---	---	105.7	-39.9	---	---									
<b>Table Result:</b> Pass by -36.6 dB							<b>Worst Freq:</b> 0.125 MHz															
Test Site: EMI Chamber 1	Cable 1: Asset #2681			Cable 2: Asset #2610			Cable 3: ---			Antenna: Asset 2615 Loop			Preselector: ---									
Analyzer: 1168255	Preamp: None			Copyright Curtis-Straus LLC 2000																		
CSsoft Radiated Emissions Calculator v 1.017.225 Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																						



**Test Report for Rockwell Automation  
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Model # 440G-TZS21UPLH

**Radiated Emissions Table**

Date: 30-May-23		Company: Rockwell Automation EUT Desc: Guardmaster TLSZR-GD2 guard locking switch Temp: 22C Humidity: 52% Pressure: 990mbar					Work Order: X0154 EUT Operating Voltage/Frequency: 24VDC									
Frequency Range: Fundamental (Peak max-hold)							Measurement Distance: 3 m									
Notes: Model # 440G-TZS21UPLH							EUT Max Freq: 8MHz									
							FCC 15.209(a)									
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB <sub>µ</sub> V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB <sub>µ</sub> V/m)	Limit (dB <sub>µ</sub> V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB <sub>µ</sub> V/m)	Margin (dB)	Result (Pass/Fail)				
X-axis Without Actuator																
Para	0.125	47.5	29.6	50.5	0.0	68.4	---	---	---	105.7	-37.3	---				
Perp	0.125	45.2	29.6	50.5	0.0	66.1	---	---	---	105.7	-39.6	---				
Para to Floor	0.125	38.9	29.6	50.5	0.0	59.8	---	---	---	105.7	-45.9	---				
Y-Axis Without Actuator																
Para	0.125	36.7	29.6	50.5	0.0	57.6	---	---	---	105.7	-48.1	---				
Perp	0.125	31.8	29.6	50.5	0.0	52.7	---	---	---	105.7	-53.0	---				
Z-Axis Without Actuator																
Para	0.125	47.2	29.6	50.5	0.0	68.1	---	---	---	105.7	-37.6	---				
Perp	0.125	45.0	29.6	50.5	0.0	65.9	---	---	---	105.7	-39.8	---				
X-axis With Actuator Position 1																
Para	0.125	48.2	29.6	50.5	0.0	69.1	---	---	---	105.7	-36.6	---				
Perp	0.125	44.7	29.6	50.5	0.0	65.6	---	---	---	105.7	-40.1	---				
Para to Floor	0.125	39.6	29.6	50.5	0.0	60.5	---	---	---	105.7	-45.2	---				
Y-Axis With Actuator Position 1																
Para	0.125	37.2	29.6	50.5	0.0	58.1	---	---	---	105.7	-47.6	---				
Perp	0.125	30.1	29.6	50.5	0.0	51.0	---	---	---	105.7	-54.7	---				
Z-Axis With Actuator Position 1																
Para	0.125	47.9	29.6	50.5	0.0	68.8	---	---	---	105.7	-36.9	---				
Perp	0.125	45.6	29.6	50.5	0.0	66.5	---	---	---	105.7	-39.2	---				
X-axis With Actuator Position 2																
Para	0.125	48.9	29.6	50.5	0.0	69.8	---	---	---	105.7	-35.9	---				
Perp	0.125	46.0	29.6	50.5	0.0	66.9	---	---	---	105.7	-38.8	---				
Para to Floor	0.125	40.7	29.6	50.5	0.0	61.6	---	---	---	105.7	-44.1	---				
Y-Axis With Actuator Position 2																
Para	0.125	35.9	29.6	50.5	0.0	56.8	---	---	---	105.7	-48.9	---				
Perp	0.125	28.1	29.6	50.5	0.0	49.0	---	---	---	105.7	-56.7	---				
Z-Axis With Actuator Position 2																
Para	0.125	48.0	29.6	50.5	0.0	68.9	---	---	---	105.7	-36.8	---				
Perp	0.125	45.9	29.6	50.5	0.0	66.8	---	---	---	105.7	-38.9	---				
<b>Table Result:</b> Pass							<b>Worst Freq:</b> 0.125 MHz									
Test Site: EMI Chamber 1			Cable 1: Asset #1507			Cable 2: Asset #1508			Cable 3: Asset #1509							
Analyzer: Gold			Preamp: Asset #2311			Antenna: Lg Loop			Preselector: ---							
CSsoft Radiated Emissions Calculator v 1.017.225																
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																



**Test Report for Rockwell Automation  
Report No. EX0154-1 Issue 2**



Model # 440G-TZS21UTLH

**Radiated Emissions Table**

		Date: 30-May-23		Company: Rockwell Automation				Work Order: X0154					
		Engineer: Ryan M. Brown		EUT Desc: Guardmaster TLSZR-GD2 guard locking switch				EUT Operating Voltage/Frequency: 24VDC					
		Temp: 22C		Humidity: 52%		Pressure: 990mbar							
		Frequency Range: Fundamental (Peak max-hold)						Measurement Distance: 3 m					
		Notes: Model # 440G-TZS21UTLH						EUT Max Freq: 8MHz					
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB <sub>µ</sub> V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB <sub>µ</sub> V/m)	---						
							Limit (dB <sub>µ</sub> V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB <sub>µ</sub> V/m)	Margin (dB)	Result (Pass/Fail)	
X-axis Without Actuator							---	---	---				
Para	0.125	48.1	29.6	50.5	0.0	69.0	---	---	105.7				
Perp	0.125	45.1	29.6	50.5	0.0	66.0	---	---	105.7				
Para to Floor	0.125	43.2	29.6	50.5	0.0	64.1	---	---	105.7				
Y-Axis Without Actuator							---	---	---				
Para	0.125	35.9	29.6	50.5	0.0	56.8	---	---	105.7				
Perp	0.125	27.8	29.6	50.5	0.0	48.7	---	---	105.7				
Z-Axis Without Actuator							---	---	---				
Para	0.125	48.2	29.6	50.5	0.0	69.1	---	---	105.7				
Perp	0.125	45.3	29.6	50.5	0.0	66.2	---	---	105.7				
X-axis With Actuator Position 1							---	---	---				
Para	0.125	48.3	29.6	50.5	0.0	<b>69.2</b>	---	---	105.7				
Perp	0.125	45.1	29.6	50.5	0.0	66.0	---	---	105.7				
Para to Floor	0.125	43.3	29.6	50.5	0.0	64.2	---	---	105.7				
Y-Axis With Actuator Position 1							---	---	---				
Para	0.125	37.0	29.6	50.5	0.0	57.9	---	---	105.7				
Perp	0.125	30.1	29.6	50.5	0.0	51.0	---	---	105.7				
Z-Axis With Actuator Position 1							---	---	---				
Para	0.125	48.3	29.6	50.5	0.0	<b>69.2</b>	---	---	105.7				
Perp	0.125	45.4	29.6	50.5	0.0	66.3	---	---	105.7				
Para to Floor	0.125	43.2	29.6	50.5	0.0	64.1	---	---	105.7				
X-axis With Actuator Position 2							---	---	---				
Para	0.125	48.3	29.6	50.5	0.0	<b>69.2</b>	---	---	105.7				
Perp	0.125	45.3	29.6	50.5	0.0	66.2	---	---	105.7				
Para to Floor	0.125	43.1	29.6	50.5	0.0	64.0	---	---	105.7				
Y-Axis With Actuator Position 2							---	---	---				
Para	0.125	35.5	29.6	50.5	0.0	56.4	---	---	105.7				
Perp	0.125	29.3	29.6	50.5	0.0	50.2	---	---	105.7				
Z-Axis With Actuator Position 2							---	---	---				
Para	0.125	48.1	29.6	50.5	0.0	69.0	---	---	105.7				
Perp	0.125	45.3	29.6	50.5	0.0	66.2	---	---	105.7				
<b>Table Result:</b>		Pass	by	-36.5 dB					<b>Worst Freq:</b> 0.125 MHz				
Test Site: EMI Chamber 1		Cable 1: Asset #1507		Cable 2: Asset #1508		Cable 3: Asset #1509							
Analyzer: Gold		Preamp: Asset #2311		Antenna: Lg Loop		Preselector: ---							
CSsoft Radiated Emissions Calculator v 1.017.225						Copyright Curtis-Straus LLC 2000							
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor													

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**Test Report for Rockwell Automation**  
**Report No. EX0154-1 Issue 2**



Model # 440G-TZS21UTRH

**Radiated Emissions Table**

Date: 30-May-23		Company: Rockwell Automation					Work Order: X0154									
Engineer: Ryan M. Brown		EUT Desc: Guardmaster TLSZR-GD2 guard locking switch					EUT Operating Voltage/Frequency: 24VDC									
Temp: 22C		Humidity: 52% Pressure: 990mbar														
Frequency Range: Fundamental (Peak max-hold)										Measurement Distance: 3 m						
Notes: Model # 440G-TZS21UTRH										EUT Max Freq: 8MHz						
Antenna Polarization (0° - 90°)	Frequency (MHz)	Reading (dB <sub>μ</sub> V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB <sub>μ</sub> V/m)	---			FCC 15.209(a)						
							Limit (dB <sub>μ</sub> V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB <sub>μ</sub> V/m)	Margin (dB)	Result (Pass/Fail)				
X-axis Without Actuator																
Para	0.125	47.5	29.6	50.5	0.0	68.4	---	---	---	105.7	-37.3	---				
Perp	0.125	43.2	29.6	50.5	0.0	64.1	---	---	---	105.7	-41.6	---				
Y-Axis Without Actuator																
Para	0.125	35.5	29.6	50.5	0.0	56.4	---	---	---	105.7	-49.3	---				
Perp	0.125	28.1	29.6	50.5	0.0	49.0	---	---	---	105.7	-56.7	---				
Z-Axis Without Actuator																
Para	0.125	47.9	29.6	50.5	0.0	68.8	---	---	---	105.7	-36.9	---				
Perp	0.125	45.1	29.6	50.5	0.0	66.0	---	---	---	105.7	-39.7	---				
Para to Floor	0.125	42.7	29.6	50.5	0.0	63.6	---	---	---	105.7	-42.1	---				
X-axis With Actuator Position 1																
Para	0.125	48.2	29.6	50.5	0.0	69.1	---	---	---	105.7	-36.6	---				
Perp	0.125	44.6	29.6	50.5	0.0	65.5	---	---	---	105.7	-40.2	---				
Para to Floor	0.125	42.0	29.6	50.5	0.0	62.9	---	---	---	105.7	-42.8	---				
Y-Axis With Actuator Position 1																
Para	0.125	35.6	29.6	50.5	0.0	56.5	---	---	---	105.7	-49.2	---				
Perp	0.125	28.9	29.6	50.5	0.0	49.8	---	---	---	105.7	-55.9	---				
Z-Axis With Actuator Position 1																
Para	0.125	47.4	29.6	50.5	0.0	68.3	---	---	---	105.7	-37.4	---				
Perp	0.125	45.1	29.6	50.5	0.0	66.0	---	---	---	105.7	-39.7	---				
X-axis With Actuator Position 2																
Para	0.125	47.4	29.6	50.5	0.0	68.3	---	---	---	105.7	-37.4	---				
Perp	0.125	44.7	29.6	50.5	0.0	65.6	---	---	---	105.7	-40.1	---				
Y-Axis With Actuator Position 2																
Para	0.125	34.9	29.6	50.5	0.0	55.8	---	---	---	105.7	-49.9	---				
Perp	0.125	27.9	29.6	50.5	0.0	48.8	---	---	---	105.7	-56.9	---				
Z-Axis With Actuator Position 2																
Para	0.125	47.4	29.6	50.5	0.0	68.3	---	---	---	105.7	-37.4	---				
Perp	0.125	45.4	29.6	50.5	0.0	66.3	---	---	---	105.7	-39.4	---				

**Table Result:** Pass by -36.6 dB

**Worst Freq:** 0.125 MHz

Test Site: EMI Chamber 1

Cable 1: Asset #1507

Cable 2: Asset #1508

Cable 3: Asset #1509

Analyzer: Gold

Preamp: Asset #2311

Antenna: Lg Loop

Preselector: ---

CSsoft Radiated Emissions Calculator v 1.017.225

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Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor

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**Test Report for Rockwell Automation  
Report No. EX0154-1 Issue 2**



## **4.3 RADIATED SPURIOUS EMISSIONS**

### **4.3.1 LIMITS**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emissions limits specified in Section 15.209(a).

<b>FREQUENCIES (MHz)</b>	<b>FIELD STRENGTH (microvolts/meter)</b>	<b>MEASUREMENT DISTANCE (meters)</b>
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. Lower limit applies at the transition frequencies.
2.  $dB\mu V/m = 20 * \log(\mu V/m)$ .
3. As specified in 15.35(b), for frequencies above 1000MHz, field strength limits are based on the use of measurement instrumentation employing an average detector function. However, there is also a limit on the peak level of the emissions that is 20 dB above the maximum permitted average emission limit.
4. Limit conversion below 30MHz is done by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as allowed in FCC 15.31(f)(2).  
$$\text{Limit}(3m) = \text{Limit}(30m) + 40 * \log(30/3) = \text{Limit}(30m) + 40$$
$$\text{Limit}(3m) = \text{Limit}(300m) + 40 * \log(300/3) = \text{Limit}(300m) + 80$$
5. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of  $377\Omega$ . For example, the measurement frequency 124.997KHz resulted in a level of 65.3dB $\mu$ V/m, which is equivalent to  $65.3 - 51.5 = 13.8$ dB $\mu$ A/m, which has the same margin, -40.4 dB, to the corresponding RSS-GEN Table 6 limit as it has to the 15.209(a) limit.



## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



### 5.3.1 TEST EQUIPMENT USED

Dates of Test: 3/15/2023 to 3/16/2023

Rev. 3/1/2023

	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
<b>Spectrum Analyzers / Receivers /Preselectors</b>								
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/12/2023	8/12/2022
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	1/23/2024	1/23/2023
<b>Radiated Emissions Sites</b>	<b>FCC Code</b>	<b>IC Code</b>	<b>VCCI Code</b>	<b>Range</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	11/29/2024	11/29/2022
<b>Preamps /Couplers Attenuators / Filters</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/17/2023	10/17/2022
<b>Antennas</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Red-White BiLog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	10/25/2023	11/25/2021
2615 Active Loop Antenna	9KHz-30MHz	6502	EMCO	2049	2615	I	1/18/2025	1/18/2023
<b>Meteorological Meters/Chambers</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	12/15/2025	12/15/2022	
Asset 2707	SD700	EXTECH	A.115171	2707	I	1/13/2025	1/13/2023	
<b>Cables</b>	<b>Range</b>		<b>Mfr</b>		<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>	
Asset #2474	9KHz-18GHz		MegaPhase		II	11/1/2023	11/1/2022	
Asset #2610	9KHz-18GHz		Pasternack		II	3/3/2024	3/3/2023	
Asset #2681	9KHz-18GHz		Pasternack		II	12/13/2023	12/13/2022	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Date of Test: 3/20/2023

Rev. 3/3/2023

	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
<b>Spectrum Analyzers / Receivers /Preselectors</b>								
Rental MXE EMI Receiver(1168255)	20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/12/2023	8/12/2022
<b>Radiated Emissions Sites</b>	<b>FCC Code</b>	<b>IC Code</b>	<b>VCCI Code</b>	<b>Range</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
EMI Chamber 1	719150	2762A-6	A-0015	30-1000MHz	1685	I	11/29/2024	11/29/2022
<b>Preamps /Couplers Attenuators / Filters</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/17/2023	10/17/2022
<b>Antennas</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Red-White BiLog	30-2000MHz	JB1	Sunol	A091604-1	1105	I	10/25/2023	11/25/2021
<b>Meteorological Meters/Chambers</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>	
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	12/15/2025	12/15/2022	
Asset 2707	SD700	EXTECH	A.115171	2707	I	1/13/2025	1/13/2023	
<b>Cables</b>	<b>Range</b>		<b>Mfr</b>		<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>	
Asset #2474	9KHz-18GHz		MegaPhase		II	11/1/2023	11/1/2022	
Asset #2610	9KHz-18GHz		Pasternack		II	3/3/2024	3/3/2023	
Asset #2681	9KHz-18GHz		Pasternack		II	12/13/2023	12/13/2022	

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



**Test Report for Rockwell Automation  
Report No. EX0154-1 Issue 2**



### 5.3.2 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber.
- b. For below 30MHz, a loop antenna with its lowest point 1m above the ground was placed 3m away from the EUT and it was rotated 0 and 90 degrees around its vertical axis.
- c. In 30MHz-1GHz range, a BiConiLog antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. Following bandwidths were used during emissions testing:

<b>Freq. (MHz)</b>	<b>RBW</b>	<b>VBW</b>	<b>Pre-scan</b>	<b>Final</b>
0.009-0.15	200Hz	1kHz	Peak	Quasi Peak
0.15-30	9kHz	30kHz	Peak	Quasi Peak
30-1000	120kHz	300kHz	Peak	Quasi Peak

If peak measurements were below the applicable limit, QPk measurements were not performed.



## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2

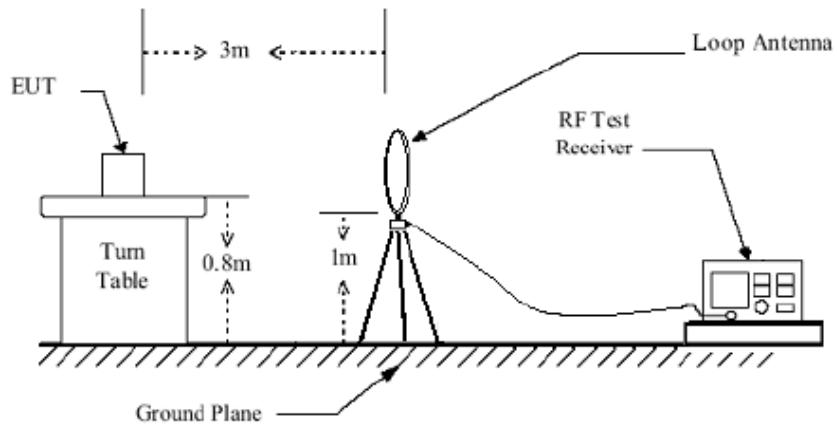


### 5.3.3 DEVIATIONS

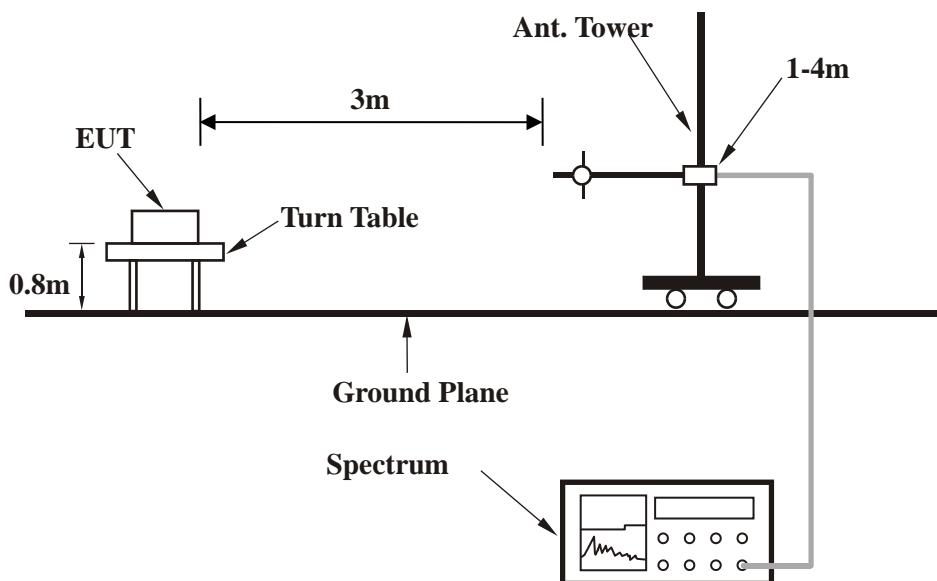
No deviations from the standard.

### 5.3.4 TEST SETUP

#### Below 30MHz Test Setup



#### 30MHz - 1GHz Test Setup



**Note:** For the actual test configuration, please refer to the Test Setup Photos exhibit.

### 5.3.5 EUT OPERATING CONDITIONS

EUT was operated according to the manufacturer's specifications.



## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2

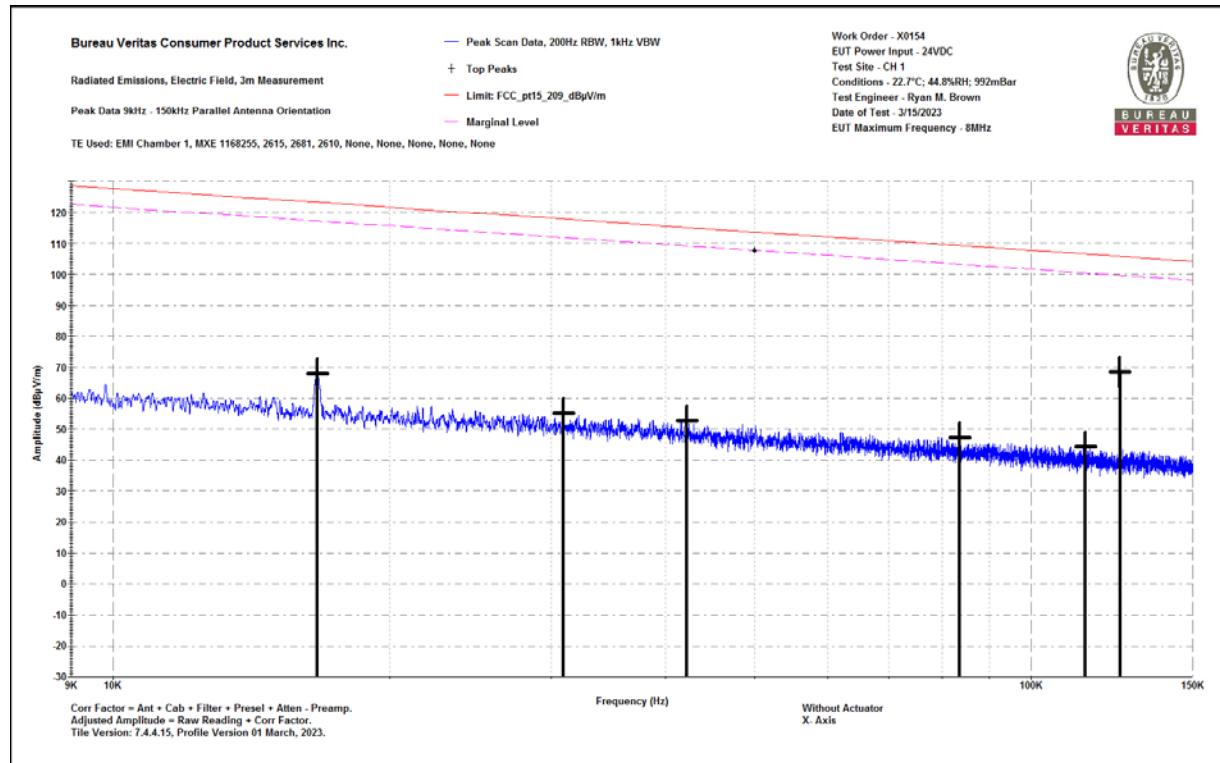


### 5.3.6 TEST RESULTS

#### Emissions below 1GHz

##### Lock Off (LED Red)

No emissions within 10dB of the limit were identified in 9kHz-30MHz range. Only plots shown below.





## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.

Radiated Emissions, Electric Field, 3m Measurement

Peak Data 9kHz - 150kHz Perpendicular Antenna Orientation

TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 200Hz RBW, 1kHz VBW

Top Peaks

Limit: FCC\_pt15\_209\_dBpV/m

Marginal Level

Work Order - X0154

EUT Power Input - 24VDC

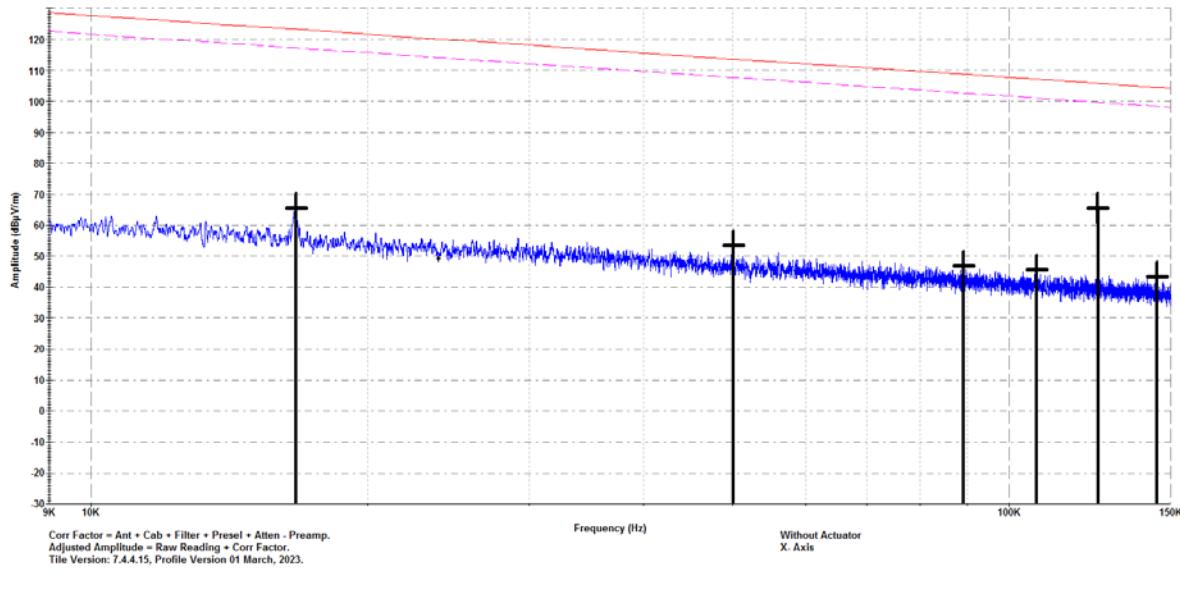
Test Site - CH 1

Conditions - 22.7°C; 44.8%RH; 992mBar

Test Engineer - Ryan M. Brown

Date of Test - 3/15/2023

EUT Maximum Frequency - 8MHz



### 0.009-0.15MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.

Radiated Emissions, Electric Field, 3m Measurement

Peak Data 150kHz - 1MHz Parallel Antenna Orientation

TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW

Top Peaks

Limit: FCC\_pt15\_209\_dBpV/m

Marginal Level

Work Order - X0154

EUT Power Input - 24VDC

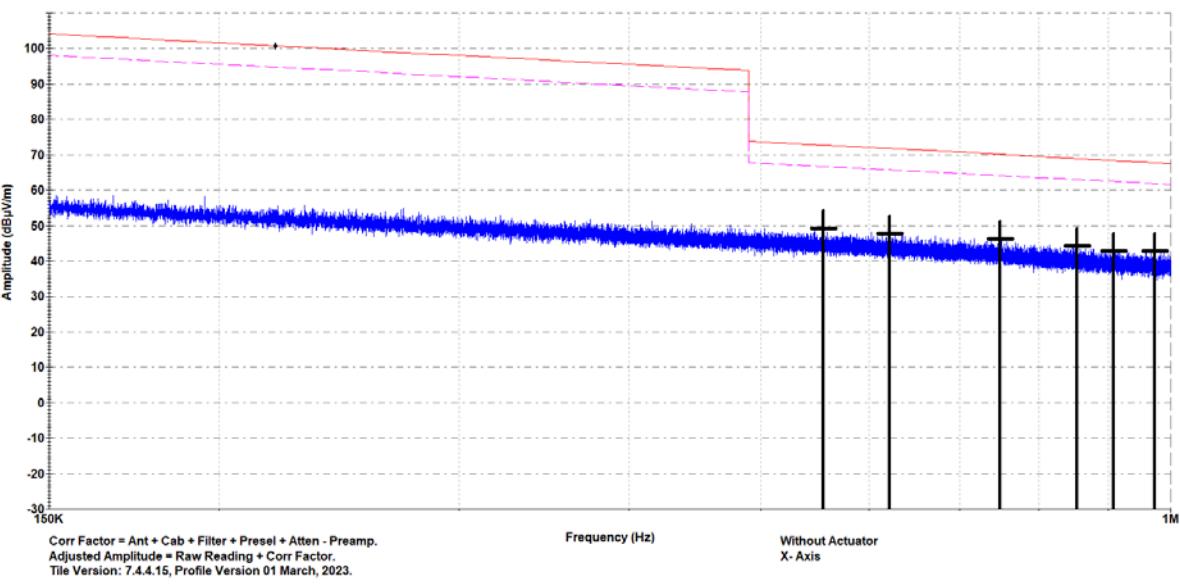
Test Site - CH 1

Conditions - 22.7°C; 44.8%RH; 992mBar

Test Engineer - Ryan M. Brown

Date of Test - 3/15/2023

EUT Maximum Frequency - 8MHz



### 0.15-1MHz Parallel

Bureau Veritas Consumer Product  
Services Inc.

One Distribution Center Circle, #1  
Littleton, MA

Tel.: (978) 486-8880  
Fax: (978) 486-8828



# Test Report for Rockwell Automation

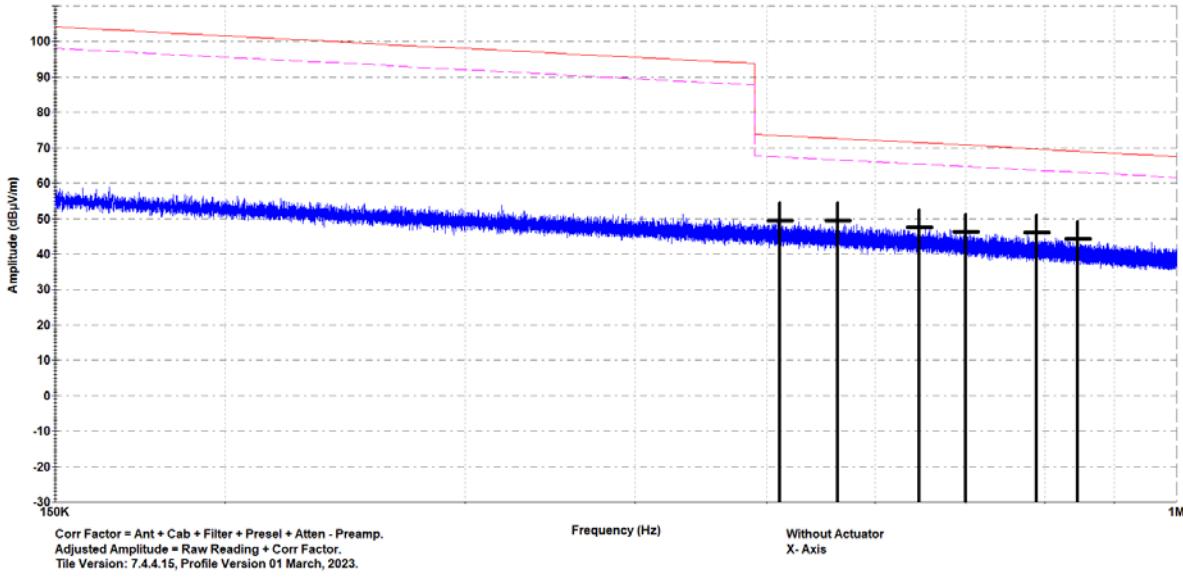
## Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 150kHz - 1MHz Perpendicular Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz

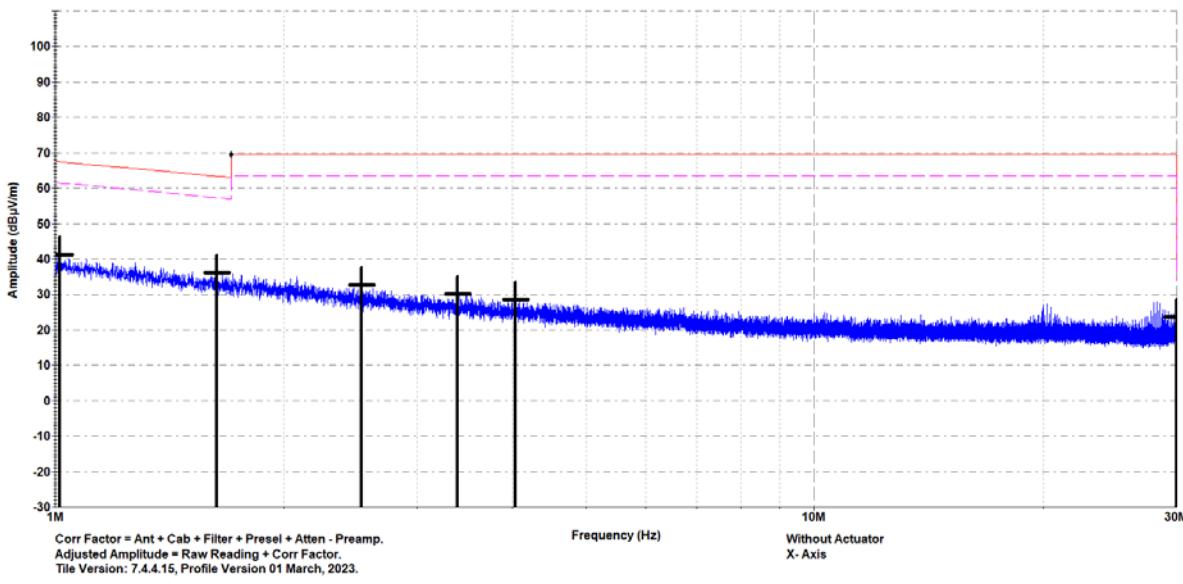


### 0.15-1MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 1-30MHz Parallel Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz



### 1-30MHz Parallel

Bureau Veritas Consumer Product Services Inc.

One Distribution Center Circle, #1 Littleton, MA

Tel.: (978) 486-8880  
Fax: (978) 486-8828



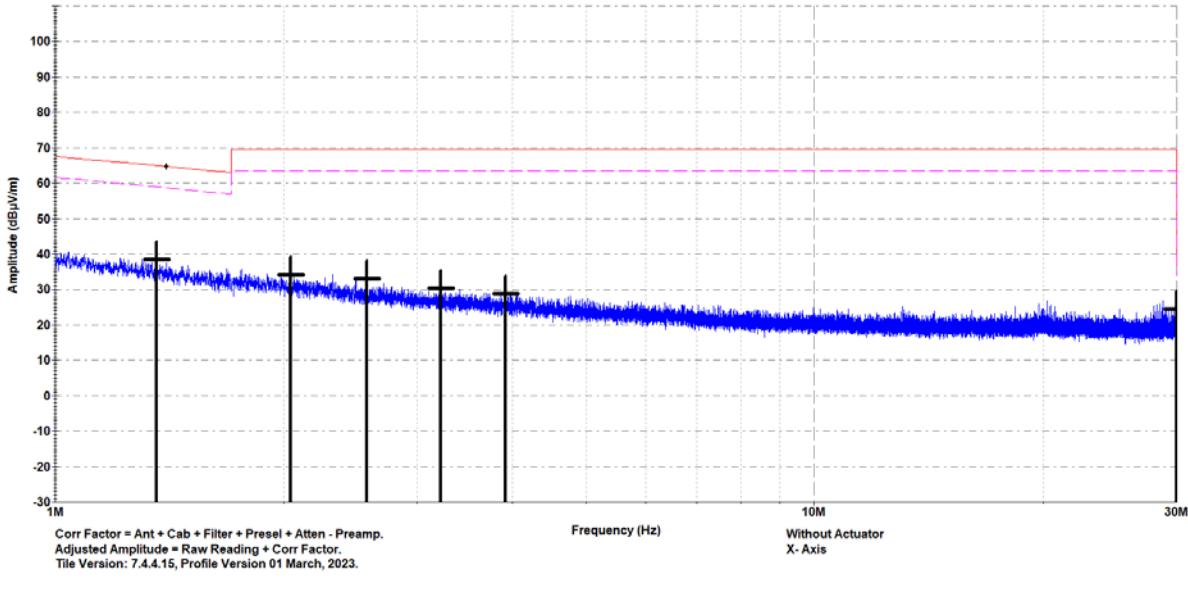
## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 1-30MHz Perpendicular Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz



### 1-30MHz Perpendicular



## Test Report for Rockwell Automation

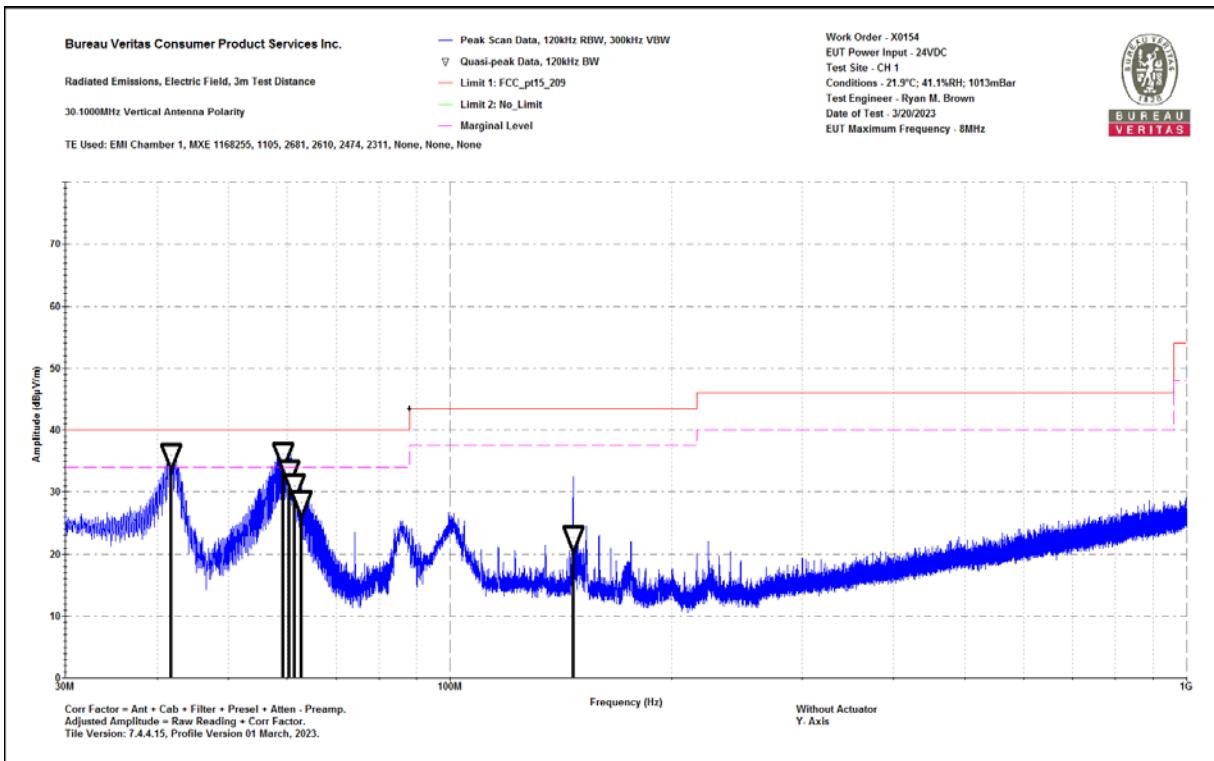
### Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.	Work Order - X0154
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 24VDC
30-1000MHz Vertical Data	Test Site - CH 1
Notes:	Conditions - 21.9°C; 41.1%RH; 1013mBar
Without Actuator	Test Engineer - Ryan M. Brown
Y- Axis	Date of Test - 3/20/2023
0	

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB/m)	Adjusted QP Amplitude (dB $\mu$ V/m)	Lim1: FCC_pt15_209 (dB $\mu$ V/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
41.753	52.3	-16.4	35.9	40	-4.1	PASS		100	128
59.236	58.4	-22.3	36.1	40	-3.9	PASS	-3.9	124	155
60.509	55.5	-22.3	33.2	40	-6.8	PASS		100	57
61.517	53.2	-22.2	31	40	-9	PASS		105	6
62.776	50.5	-22.2	28.3	40	-11.7	PASS		105	48
146.968	39.1	-16.4	22.7	43.5	-20.8	PASS		100	96

### 30-1000MHz Vertical Data Table



### 30-1000MHz Vertical Plot



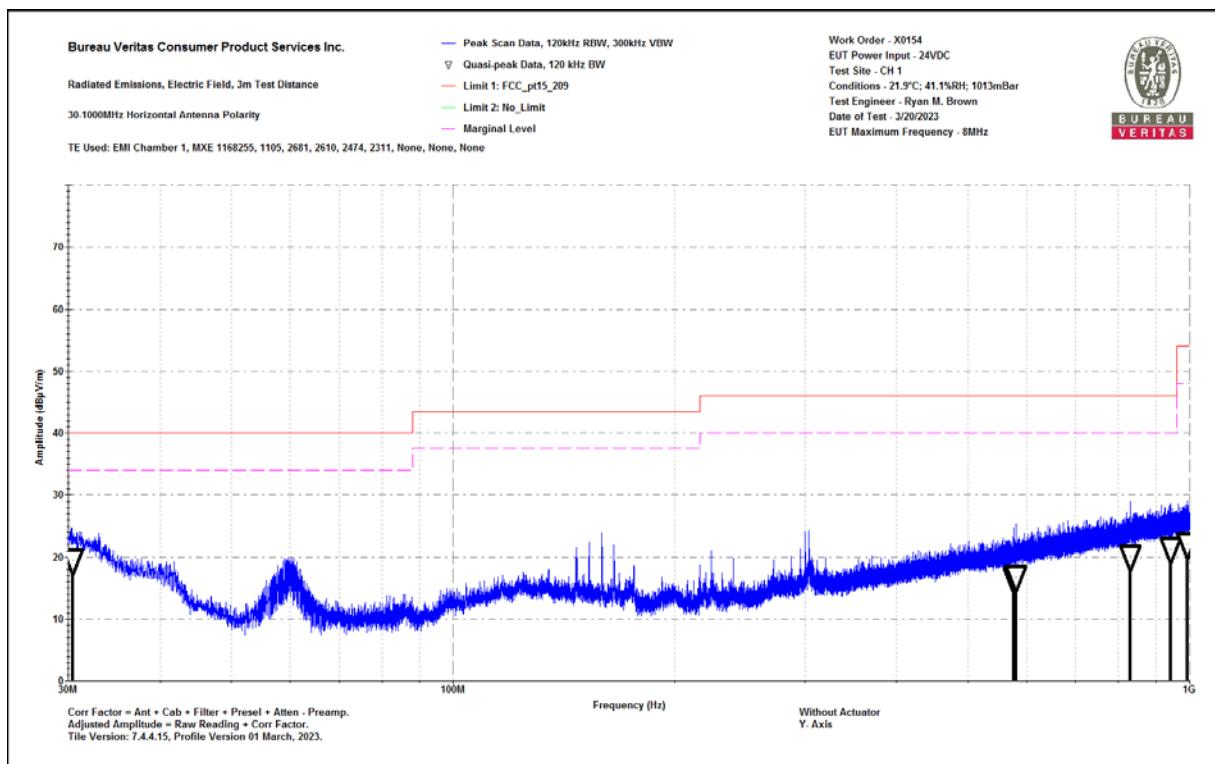
**Test Report for Rockwell Automation**  
**Report No. EX0154-1 Issue 2**



Bureau Veritas Consumer Product Services Inc.	Work Order - X0154
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 24VDC
30-1000MHz Horizontal Data	Test Site - CH 1
Notes:	Conditions - 21.9°C; 41.1%RH; 1013mBar
Without Actuator	Test Engineer - Ryan M. Brown
Y- Axis	Date of Test - 3/20/2023
0	

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB/m)	Adjusted QP Amplitude (dB $\mu$ V/m)	Lim1: FCC_pt15_209	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.422	27.5	-8.1	19.4	40	-20.6	PASS	-20.6	225	324
577.213	25.3	-8.8	16.5	46	-29.5	PASS		124	6
580.711	25.4	-8.7	16.7	46	-29.3	PASS		174	200
830.41	24.5	-4.5	20.1	46	-25.9	PASS		237	44
942.952	24.2	-2.9	21.3	46	-24.7	PASS		125	25
993.119	24.2	-2.2	22	54	-32	PASS		175	260

**30-1000MHz Horizontal Data Table**



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Fax: (978) 486-8828

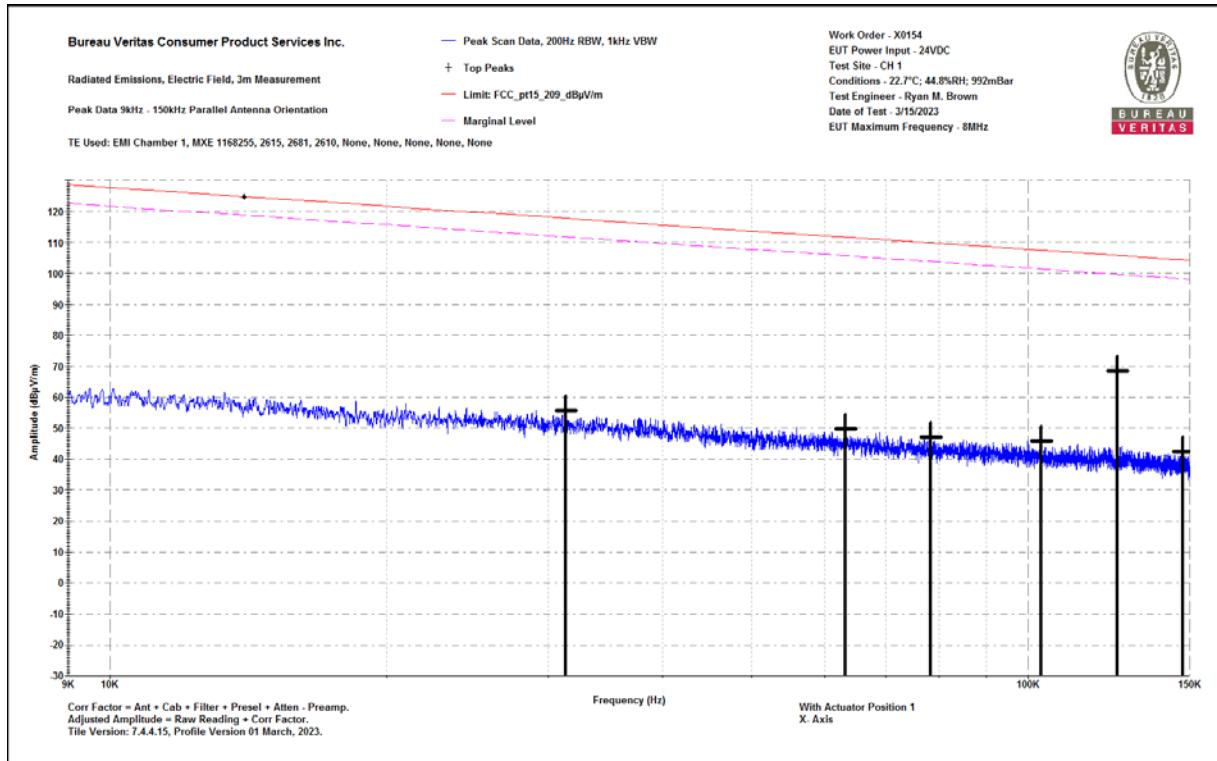


## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



### Lock On (LED Green)

No emissions within 10dB of the limit were identified in 9kHz-30MHz range. Only plots shown below.



### 0.009-0.15MHz Parallel



## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.

Radiated Emissions, Electric Field, 3m Measurement

Peak Data 9kHz - 150kHz Perpendicular Antenna Orientation

TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 200Hz RBW, 1kHz VBW

Top Peaks

Limit: FCC\_pt15\_209\_dBpV/m

Marginal Level

Work Order - X0154

EUT Power Input - 24VDC

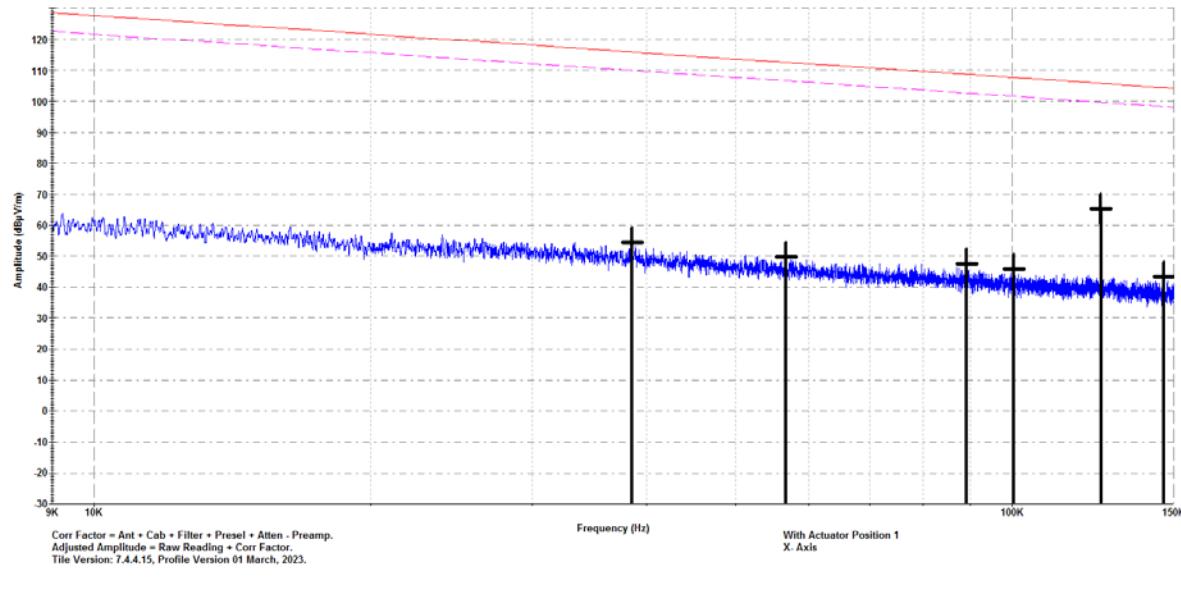
Test Site - CH 1

Conditions - 22.7°C; 44.8%RH; 992mBar

Test Engineer - Ryan M. Brown

Date of Test - 3/15/2023

EUT Maximum Frequency - 8MHz



### 0.009-0.15MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.

Radiated Emissions, Electric Field, 3m Measurement

Peak Data 150kHz - 1MHz Parallel Antenna Orientation

TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW

Top Peaks

Limit: FCC\_pt15\_209\_dBpV/m

Marginal Level

Work Order - X0154

EUT Power Input - 24VDC

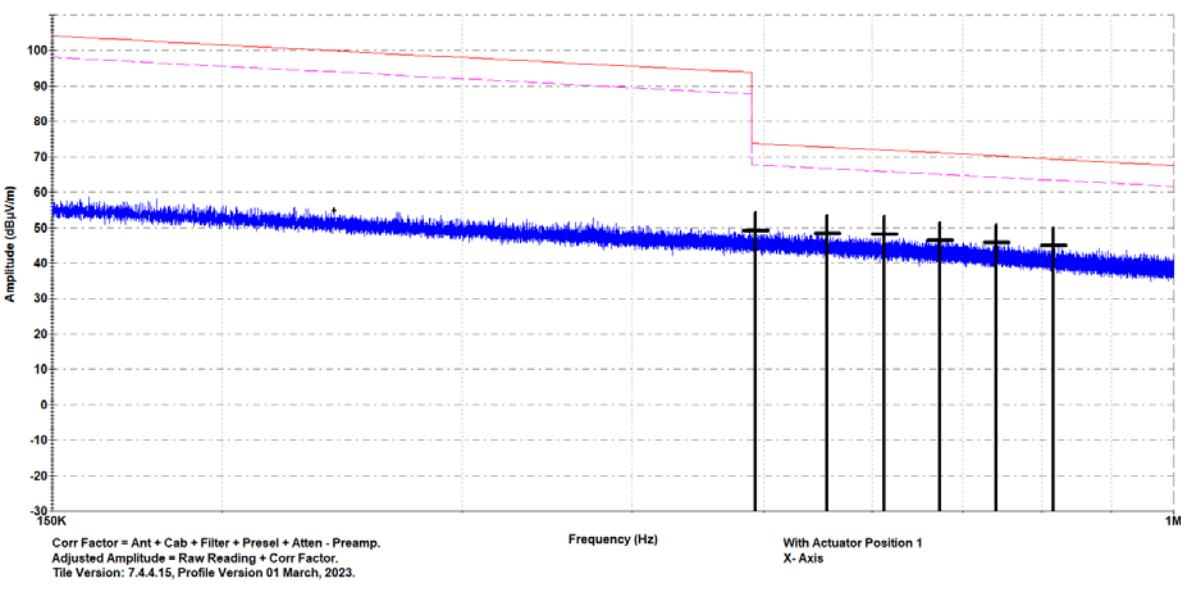
Test Site - CH 1

Conditions - 22.7°C; 44.8%RH; 992mBar

Test Engineer - Ryan M. Brown

Date of Test - 3/15/2023

EUT Maximum Frequency - 8MHz



### 0.15-1MHz Parallel

Bureau Veritas Consumer Product  
Services Inc.

One Distribution Center Circle, #1  
Littleton, MA

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Fax: (978) 486-8828



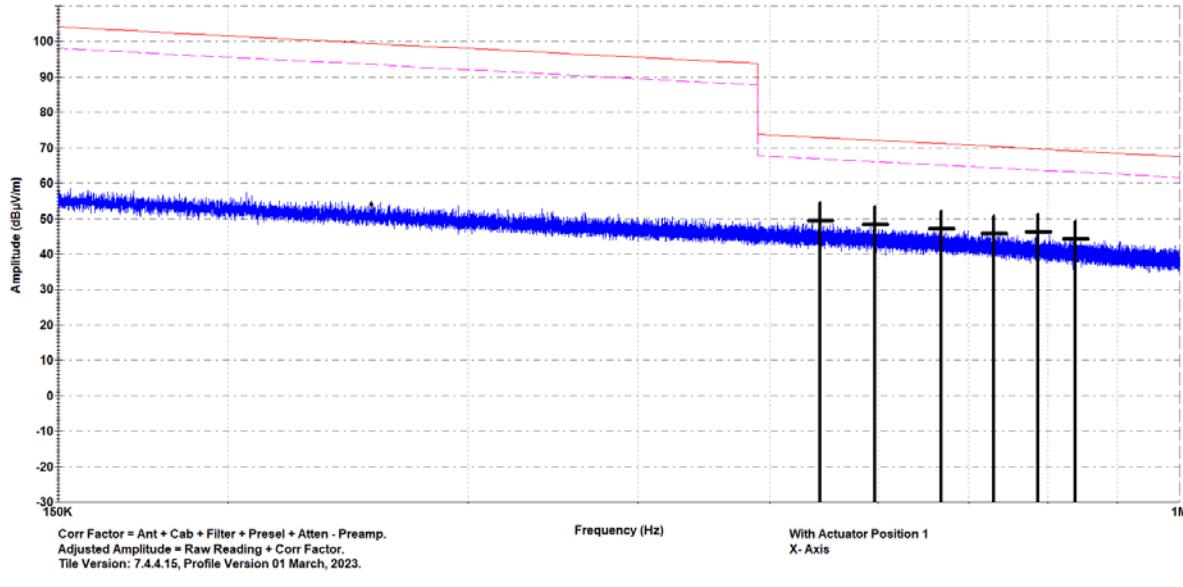
## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 150kHz - 1MHz Perpendicular Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz

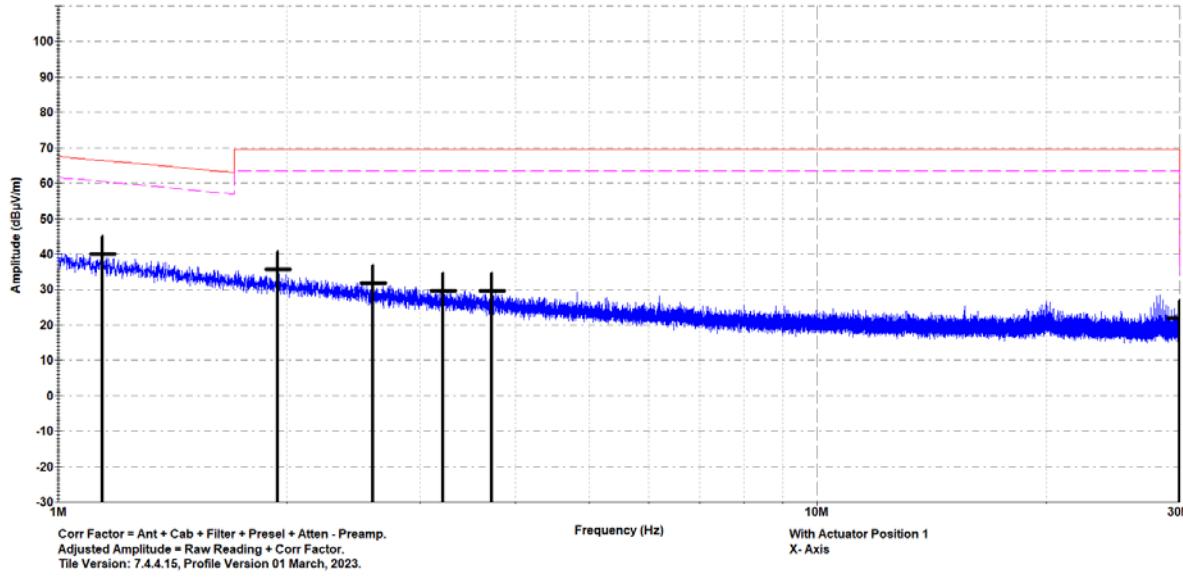


### 0.15-1MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 1-30MHz Parallel Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz



### 1-30MHz Parallel

Bureau Veritas Consumer Product  
Services Inc.

One Distribution Center Circle, #1  
Littleton, MA

Tel.: (978) 486-8880  
Fax: (978) 486-8828



# Test Report for Rockwell Automation

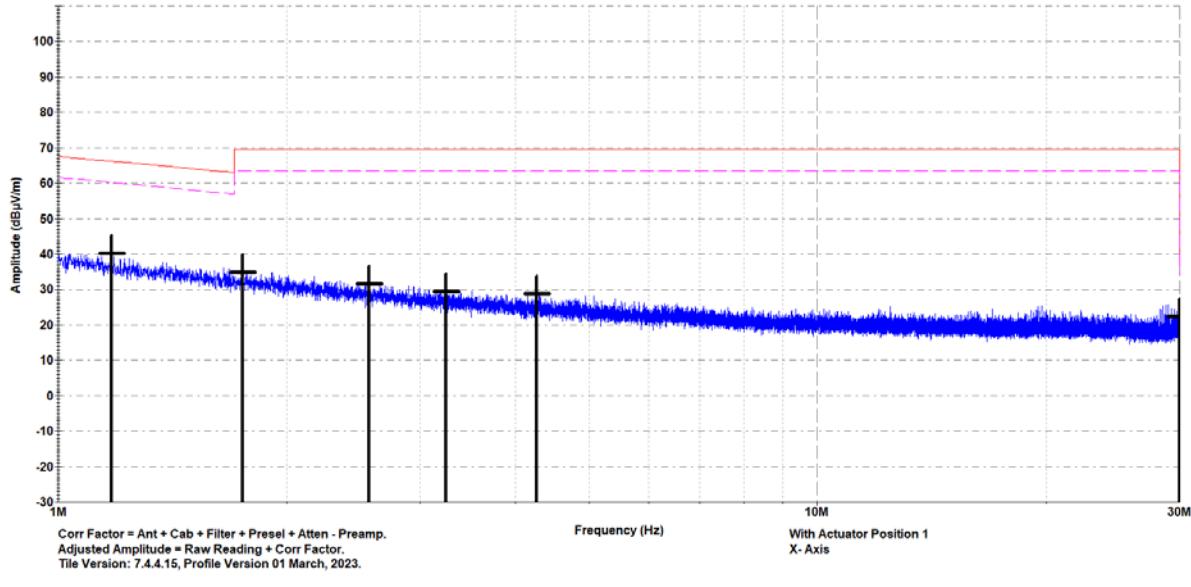
## Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.  
Radiated Emissions, Electric Field, 3m Measurement  
Peak Data 1-30MHz Perpendicular Antenna Orientation  
TE Used: EMI Chamber 1, MXE 1168255, 2615, 2681, 2610, None, None, None, None, None, None

Peak Scan Data, 9kHz RBW, 30kHz VBW  
+ Top Peaks  
Limit: FCC\_pt15\_209\_dBpV/m  
Marginal Level

Work Order - X0154  
EUT Power Input - 24VDC  
Test Site - CH 1  
Conditions - 22.7°C; 44.8%RH; 992mBar  
Test Engineer - Ryan M. Brown  
Date of Test - 3/15/2023  
EUT Maximum Frequency - 8MHz



### 1-30MHz Perpendicular



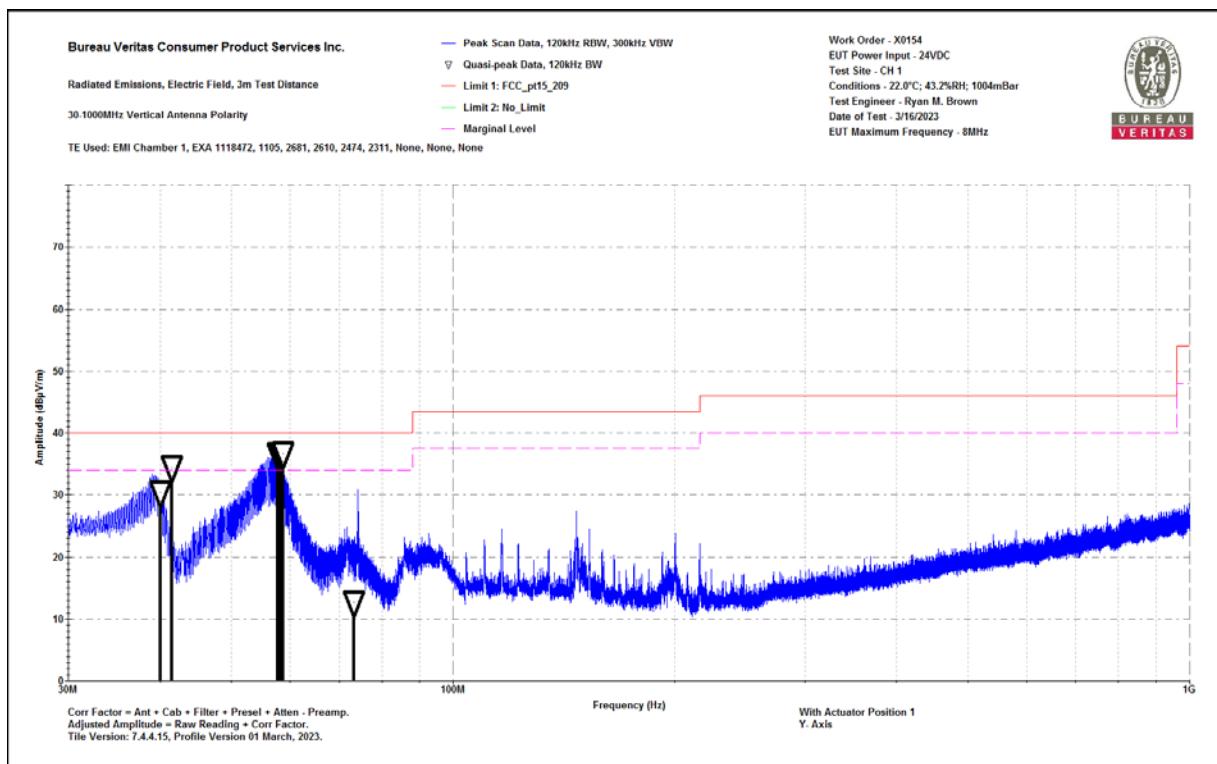
## Test Report for Rockwell Automation

### Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.		Work Order - X0154							
Radiated Emissions Electric Field 3m Distance		EUT Power Input - 24VDC							
30-1000MHz Vertical Data		Test Site - CH 1							
Notes:		Conditions - 22.0°C; 43.2%RH; 1004mBar							
With Actuator Position 1		Test Engineer - Ryan M. Brown							
Y- Axis		Date of Test - 3/16/2023							
0									
Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB/m)	Adjusted QP Amplitude (dB $\mu$ V/m)	Lim1: FCC_pt15_209 (dB $\mu$ V/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
39.997	45.5	-15.1	30.4	40	-9.6	PASS		100	25
41.482	50.6	-16.2	34.4	40	-5.6	PASS		100	0
57.751	58.9	-22.3	36.6	40	-3.4	PASS		100	85
58.743	59	-22.3	36.7	40	-3.3	PASS	-3.3	100	290
58.26	58.8	-22.3	36.5	40	-3.5	PASS		102	20
73.269	34.4	-21.7	12.7	40	-27.3	PASS		102	63

### 30-1000MHz Vertical Data Table



### 30-1000MHz Vertical Plot



## Test Report for Rockwell Automation

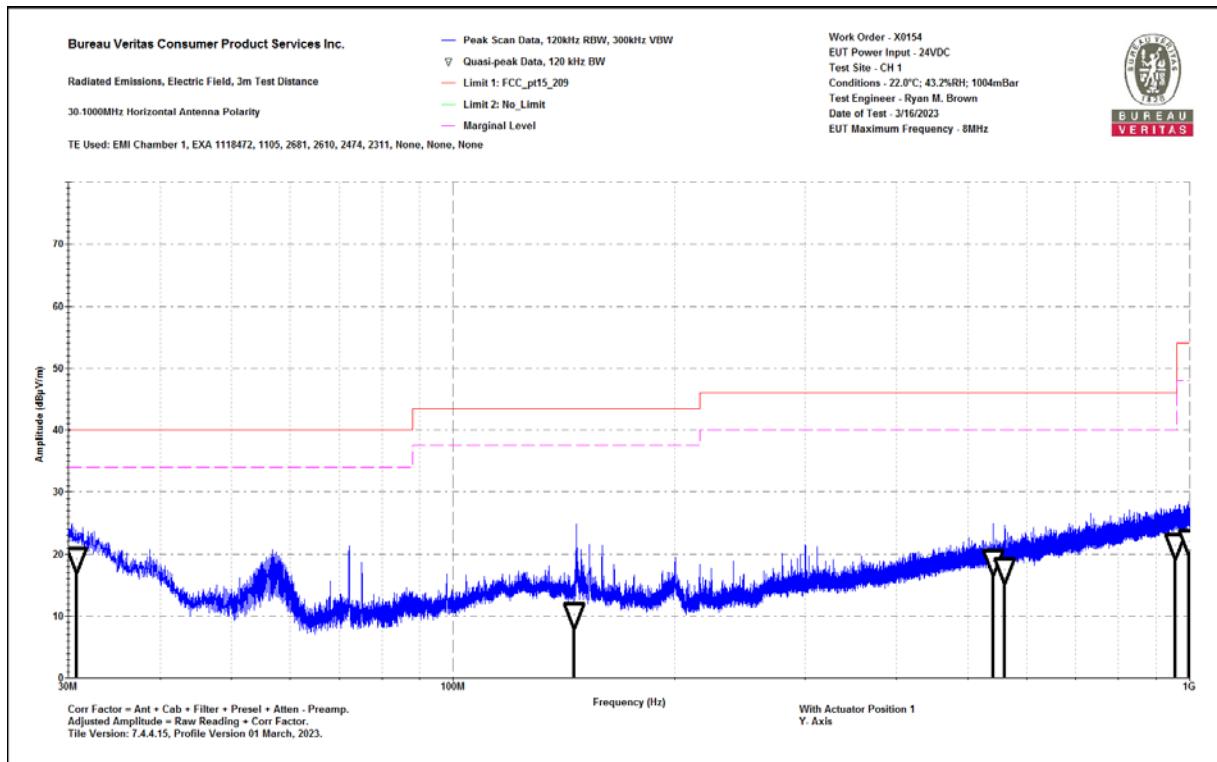
### Report No. EX0154-1 Issue 2



Bureau Veritas Consumer Product Services Inc.	Work Order - X0154
Radiated Emissions Electric Field 3m Distance	EUT Power Input - 24VDC
30-1000MHz Horizontal Data	Test Site - CH 1
Notes:	Conditions - 22.0°C; 43.2%RH; 1004mBar
With Actuator Position 1	Test Engineer - Ryan M. Brown
Y- Axis	Date of Test - 3/16/2023
0	

Frequency (MHz)	Raw QP Reading (dB $\mu$ V)	Correction Factor (dB/m)	Adjusted QP Amplitude (dB $\mu$ V/m)	Lim1: FCC_pt15_209 (dB $\mu$ V/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.819	27.6	-8.4	19.2	40	-20.8	PASS	-20.8	241	111
146.048	26.6	-16.4	10.2	43.5	-33.3	PASS		175	115
541.071	28.2	-9.4	18.8	46	-27.2	PASS		174	322
560.98	26.7	-9.2	17.5	46	-28.5	PASS		175	301
956.293	24.2	-2.9	21.4	46	-24.6	PASS		204	31
997.093	24.2	-2.2	22	54	-32	PASS		248	155

### 30-1000MHz Horizontal Data Table



### 30-1000MHz Horizontal Plot



## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2



### 4.4 99% OCCUPIED BANDWIDTH

#### 4.4.1 LIMITS

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured. [RSS-Gen Issue 5 Section 6.7].

#### 4.4.2 TEST SETUP

Same as radiated spurious emissions setup below 30MHz (Section 4.3.5).

#### 4.4.3 TEST EQUIPMENT USED

Date of Test: 3/16/2023

Rev. 3/3/2023										
Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on	
Rental MXE EMI Receiver(1168255)		20Hz-8.4GHz	N9038A	Agilent	MY53290009	1168255	I	8/12/2023	8/12/2022	
Radiated Emissions Sites EMI Chamber 1		FCC Code 719150	IC Code 2762A-6	VCCI Code A-0015	Range 30-1000MHz	Asset 1685	Cat I	Calibration Due 11/29/2024	Calibrated on 11/29/2022	
Antennas 2615 Active Loop Antenna		Range 9KHz-30MHz	MN 6502	Mfr EMCO	SN 2049	Asset 2615	Cat I	Calibration Due 1/18/2025	Calibrated on 1/18/2023	
Meteorological Meters/Chambers Weather Clock (Pressure Only) Asset 2707		MN BA928 SD700	Mfr Oregon Scientific EXTECH	SN C3166-1 A.115171	Asset 831 2707	Cat I	Calibration Due 12/15/2025 1/13/2025	Calibrated on 12/15/2022 1/13/2023		
Cables Asset #2610 Asset #2681		Range 9KHz-18GHz 9KHz-18GHz	Mfr Pasternack Pasternack			Cat II	Calibration Due 3/3/2024 12/13/2023	Calibrated on 3/3/2023 12/13/2022		

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

#### 4.4.4 TEST PROCEDURES

Per RSS-Gen Issue 5 Section 6.7.

#### 4.4.5 DEVIATIONS

No deviations from the standard.

#### 4.4.6 EUT OPERATING CONDITIONS

EUT was operated according to manufacturer's specifications.

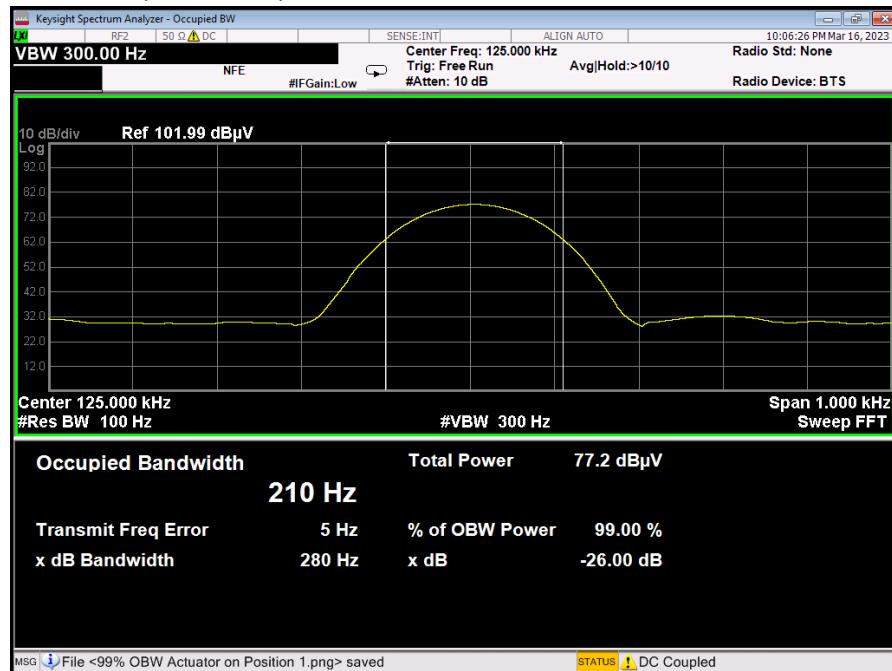


## Test Report for Rockwell Automation Report No. EX0154-1 Issue 2

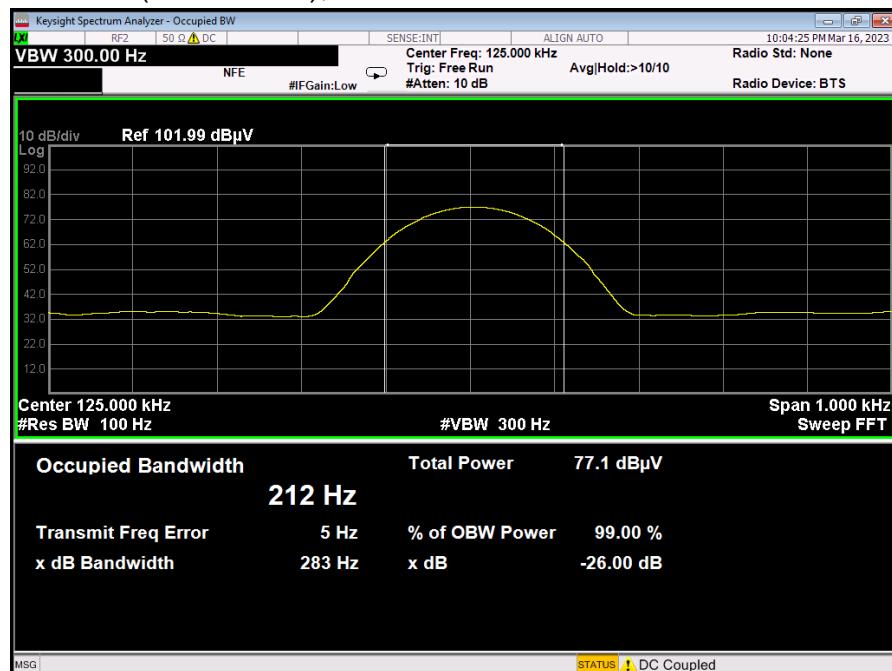


### 4.4.7 TEST RESULTS

Lock Off (LED Red), Measured 99% OBW: 210 Hz



Lock On (LED Green), Measured 99% OBW: 212 Hz





**Test Report for Rockwell Automation  
Report No. EX0154-1 Issue 2**



## **5 PHOTOGRAPHS OF THE TEST CONFIGURATION**

Please refer to the Test Setup Photos exhibit.



**Test Report for Rockwell Automation  
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## **6 APPENDIX A – MODIFICATIONS**

No modifications were made to the EUT during testing.

**---END OF REPORT---**